

Cumulative Index to NASA Tech Briefs, 1986-1990

Volumes 10-14

APRIL 1992



Electronic Components and Circuits



Electronic Systems



Physical Sciences



Materials



Computer Programs



Mechanics



Machinery



Fabrication Technology



Mathematics and Information Sciences



Life Sciences

(NASA-TM-109378) CUMULATIVE INDEX
TO NASA TECH BRIEFS, 1986-1990,
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Unclas

INTRODUCTION

Tech Briefs are short announcements of new technology derived from the research and development activities of the National Aeronautics and Space Administration. These briefs emphasize information considered likely to be transferrable across industrial, regional, or disciplinary lines and are issued to encourage commercial application.

This *Cumulative Index to NASA Tech Briefs* contains abstracts and four indexes — subject, personal author (innovator), originating center, and tech brief number — for 1986-1990 Tech Briefs.

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TYPICAL ABSTRACT ENTRY

TECH BRIEF NUMBER
↓
B90-10084

TITLE → **WIDEBAND MICROSTRIP ANTENNA-FEEDING ARRAY**

INNOVATOR → JOHN HUANG (Caltech)

DATE → Mar. 1990 Additional information available through: NASA
CASI, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ORIGINATING CENTER NUMBER → **NPO-17548**

Vol. 14, No. 3, P. 26 ← REFERENCE IN NASA TECH BRIEFS

ABSTRACT ←
Special impedance-matching probes help reduce feed complexity. Lightweight array of microstrip antenna elements designed to transmit and illuminate reflector antenna with circularly polarized radiation at 1,545 to 1,550 MHz and to receive circularly polarized radiation at 1,646 to 1,660 MHz. Microstrip array is cluster of 7 subarrays containing total of 28 microstrip patches. Produces circularly polarized beam with suitable edge taper to illuminate reflector antenna. Tear drop-shaped feed probe provides gradual change of field from coaxial transmission line into microstrip substrate. Intended to be part of larger overlapper-cluster array generating multiple contiguous beams.

Originating Center Prefixes

ARC	Ames Research Center
GSC	Goddard Space Flight Center
HQN	NASA Headquarters
KSC	Kennedy Space Center
LAR	Langley Research Center
LEW	Lewis Research Center
MFS	Marshall Space Flight Center
MSC	Johnson Space Center (formerly Manned Spacecraft Center)
NPO	Jet Propulsion Laboratory/NASA Pasadena Office

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APRIL 1992

01 ELECTRONIC COMPONENTS AND CIRCUITS

B86-10001

MICROSTRIP ANTENNA GENERATES CIRCULARLY POLARIZED BEAM

J. HUANG (Caltech)

Jul. 1986

NPO-16460

Vol. 10, No. 1, P. 32

Circular microstrip antenna excited with higher order transverse magnetic (TM) modes generates circularly polarized, conical radiation patterns. Found both theoretically and experimentally that peak direction of radiation pattern is varied within wide angular range by combination of mode selection and loading substrate with materials of different dielectric constants.

B86-10002

IMPROVED HIGH/LOW JUNCTION SILICON SOLAR CELL

A. NEUGROSCHEL (University of Florida), S. C. PAO (University of Florida), F. A. LINDHOLM (University of Florida), and J. G. FOSSUM (University of Florida)

Jul. 1986

LEW-13618

Vol. 10, No. 1, P. 34

Method developed to raise value of open-circuit voltage in silicon solar cells by incorporating high/low junction in cell emitter. Power-conversion efficiency of low-resistivity silicon solar cell considerably less than maximum theoretical value mainly because open-circuit voltage is smaller than simple p/n junction theory predicts. With this method, air-mass-zero open-circuit voltage increased from 600 mV level to approximately 650 mV.

B86-10003

INCREASED SPECTRAL RESPONSE FOR CHARGE-COUPLED DEVICES

J. R. JANESICK (Caltech), and T. ELLIOTT (Caltech)

Jul. 1986

NPO-16150 AND NPO-16290

Vol. 10, No. 1, P. 38

Significant improvement in charge-coupled-device (CCD) spectral sensitivity is demonstrated over remarkable range. Improvement in quantum efficiency, in conjunction with CCD low-read-noise floor (less than 4e) opens up new scientific opportunities in fields of biology, nuclear science, laboratory plasma diagnostics, and host of other physical and astronomical applications in the UV, X-UV, and X-ray regimes.

B86-10004

SUBMICRON SILICON MOSFET

T. DAUD (Caltech)

Jul. 1986

NPO-16601

Vol. 10, No. 1, P. 40

Process for making metal-oxide/semiconductor field-effect transistors (MOSFET's) results in gate-channel lengths of only few hundred angstroms about 100 times as small as state-of-the-art devices. Gates must be shortened to develop faster MOSFET's; proposed fabrication process used to study effects of size reduction in MOS devices and eventually to build practical three-dimensional structures.

B86-10005

BURIED-DIELECTRIC-MICROSTRIP NETWORK

P. K. CHEO (United Technologies Corp.), R. A. WAGNER (United Technologies Corp.), and M. GILDEN (United Technologies Corp.)

Jul. 1986

LAR-13285

Vol. 10, No. 1, P. 42

Problem of obtaining very-broadband frequency response resolved with buried-dielectric-microstrip matching network incorporated into infrared waveguide structure. Waveguide modulator structure represents state-of-the-art of integrated optical devices: Has three-dimensional shape to accommodate three quarter-wavelength-transformers for microwave impedance matching at both input and output terminals. Microwave network, along with microstrip line designed with aid of computer, integrated with optical waveguide and used to tune line-selectable CO₂ laser that provides total tuning range of 30 GHz in two sidebands.

B86-10006

BRUSH-TYPE CONNECTORS FOR THERMOELECTRIC ELEMENTS

C. WOOD (Caltech)

Jun. 1986

NPO-16545

Vol. 10, No. 1, P. 44

Wire brushes used to connect positive and negative legs of semiconductor thermoelectric generators to power leads and heat sources and sinks. Brushes are flexible thermal and electrical conductors that readily accommodate expansion and contraction of legs with changing temperature. Thus, direct conductive coupling between heat source and sink allowed, in contrast to older and less efficient method of having to couple radiatively to accommodate thermal expansion.

B86-10007

PHASE-LOCKED LASER ARRAY WITH NONUNIFORM SPACING

D. E. ACKLEY (RCA Corp.)

Jun. 1986

LAR-13281

Vol. 10, No. 1, P. 47

To obtain phase-locked array that reliably produces single far-field lobe, configuration includes lasing stripes not placed on regular centers but located in regular way with nonuniform centers (i.e., with spacing determined by some function). Alternatively, lasing

01 ELECTRONIC COMPONENTS AND CIRCUITS

stripes placed on set of periodic arrays with different stripe-to-stripe centers interlaced onto single chip or placed in structure in which stripe-to-stripe spacing is random or pseudorandom. Monolithic, phase-locked, semiconductor-laser array design produces output laser beam comprising substantially single lobe.

B86-10008

ULTRASONIC BONDING TO METALIZED PLASTIC

B. L. CONROY (Caltech), and C. T. CRUZAN (Caltech)

Jun. 1986

NPO-16087

Vol. 10, No. 1, P. 48

New technique makes it possible to bond wires ultrasonically to conductor patterns on such soft substrates as plain or ceramic-filled polytetrafluoroethylene. With ultrasonic bonding, unpackaged chips attached to soft circuit boards. Preferred because chips require substrate area and better matched electrically to circuit board at high frequencies.

B86-10009

MICROWAVE ANTENNA WITH REDUCED NOISE LEAKAGE

A. G. CHA (Caltech)

Jun. 1986

NPO-15785

Vol. 10, No. 1, P. 48

Gain or gain-to-temperature ratio of dual-shaped subreflector receiving antenna increased when illumination is tapered near aperture edge. Taper imposed in antenna feed reduces spillover in transmitting mode and reduces noise pickup in receiving mode.

B86-10010

PULSED-CORONA ELECTROSTATIC CHARGER

W. K. RHIM (Caltech), D. D. ELLEMAN (Caltech), B. MAKIN (Caltech), and W. T. SIMMS (Caltech)

Jun. 1986

NPO-16523

Vol. 10, No. 1, P. 50

Experimental charge-generating apparatus supplies nanocoulomb charges to small objects. Purpose of experiment to develop contactless charger for solid or liquid spheroids in contactless (levitation) processing. Circuit generates high-voltage RF Pulses, applied between two electrodes in each set. Also applies 60 Hz high accelerating voltage between two sets of electrodes. Two sets of electrodes made of conductive paint on acrylic sheets, placed diametrically opposite each other in supporting cylinder.

B86-10011

CALCULATING DIRECTIVITIES OF PLANAR-ARRAY ANTENNA FEEDS

Y. RAHMAT-SAMII (Caltech), and S. W. LEE (Caltech)

Jun. 1986

NPO-16505

Vol. 10, No. 1, P. 51

Design of planar-array antennas and antenna feeds aided by new approach to calculation of array directivity. Technique takes into account polarizations, asymmetries in element patterns, nonuniform element spacings, and arbitrary excitations. Gives numerical results faster than previous integration methods, and results agree with those obtained by older methods.

B86-10012

RELIABLE ONE-SHOT SEPARATION OF CONNECTORS

W. R. HOLMBERG (McDonnell Douglas Corp.)

Jun. 1986

MSC-20839

Vol. 10, No. 1, P. 52

Concept for separating electrical connectors by remote control simple and reliable. Suitable for one-time, irreversible separations, method uses weak explosion to destroy one member of the connector.

B86-10013

FLEX CIRCUITRY FOR CONFINED SPACES

J. B. FITZPATRICK (Simmonds Precision), and L. C. MAIER (Simmonds Precision)

Jun. 1986

MSC-20773

Vol. 10, No. 1, P. 52

To facilitate installation of electronic equipment in confined spaces, circuitry preassembled on flexible wiring. Mother boards, large bypass capacitors, and interface connectors mounted on flexible wiring and tested before installation. Flexible circuits eliminate need for in-place hardwiring and allow smaller enclosures to be used.

B86-10014

IMPROVED SOLAR-CELL TUNNEL JUNCTION

T. DAUD (Caltech), and A. KACHARE (Caltech)

Jun. 1986

NPO-16526

Vol. 10, No. 1, P. 53

Efficiency of multiple-junction silicon solar cells increased by inclusion of p+/n+ tunnel junctions of highly doped GaP between component cells. Relatively low recombination velocity at GaP junction principal reason for recommending this material. Relatively wide band gap also helps increase efficiency by reducing optical losses.

B86-10015

ADVANCED IPV NICKEL/HYDROGEN CELL

J. J. SMITHRICK, M. A. MANZO, O. GONZALEZ-SANABRIA, and D. G. SOLTIS

Jun. 1986 See Also (N84-23025)

LEW-13969

Vol. 10, No. 1, P. 54

Expansion and contraction of electrode stack accommodated to increase cycle life. Three features of advanced designs new and not incorporated but fully compatible in either contemporary cells: use of alternate methods of oxygen recombination, serrated-edge separators, and expandable stack. Designs also consider electrolyte volume requirements over life of cells and are fully compatible with state-of-the-art designs. Cells improve performance, life, and usable energy leading to lighter storage devices for low Earthorbit applications for commercial or government applications.

B86-10097

ADJUSTABLE HEADBAND FOR EARPHONES

P. C. TOOLE, H. E. CHALSON, and S. BUSSEY

May 1986

KSC-11322

Vol. 10, No. 2, P. 32

New headband designed for comfort and convenience. New band consists of pair of steel head-clamping spring strips joined by tensioning screw. Cushioned side support mounted on end of one strip, and cushioned earphone and microphone mounted on end of second strip. Band reversible. Easily adjusted for head size and readily readjusted for greater comfort without removing.

B86-10098

LINEAR PHASE MODULATOR

R. H. HESSE (TRW, Inc.)

May 1986

MSC-20555

Vol. 10, No. 2, P. 34

Circuit suppresses AM component while providing matched input impedance. Phase modulation uses reflective properties of series resonant tank to reflect all of signal except for small amount in unloaded Q of coils and varactor diode. Circuit used in payload integrator of Space Shuttle S-band communications and tracking equipment, has applications in other communications and tracking equipment.

B86-10099**CROSS-ARRAY ANTENNA WITH SWITCHED STEERING**

R. S. IWASAKI (Axiomatix)

May 1986

MSC-20889**Vol. 10, No. 2, P. 38**

Selected phase shifting of feeds to antenna elements aims antenna beam. Antenna for Space Shuttle controlled in two dimensions by double-pole, double-throw switches antenna feeds. Switches control phasing of antenna elements by transposing transmission-line delay elements between feeds to pairs of elements located on opposite sides of antenna. Same principles can be applied to antennas with additional elements along each axis.

B86-10100**POSITIVE-INDEX GUIDING IN CDH-LOC LASERS**

D. BOTEZ (RCA Corp.)

May 1986

LAR-13312**Vol. 10, No. 2, P. 40**

Nonabsorbing passive region has beam-guiding capability. Convex-lensshaped layer has refractive index higher than surrounding material so serves as optical waveguide. Four times more power achieved for devices of this type not incorporating the passive region.

B86-10101**BIDIRECTIONAL DC-TO-DC POWER CONVERTER**

C. R. GRIESBACH (Martin Marietta Corp.)

May 1986

MFS-28095**Vol. 10, No. 2, P. 40**

Solid-state, series-resonant converter uses high-voltage thyristors. Converter used either to convert high-voltage, low-current dc power to low-voltage, high current power or reverse. Taking advantage of newly-available high-voltage thyristors to provide better reliability and efficiency than traditional converters that use vacuum tubes as power switches. New converter essentially maintenance free and provides greatly increased mean time between failures. Attractive in industrial applications whether or not bidirectional capability is required.

B86-10102**VIDEO PROCESSOR FOR TRANSPONDER PULSES**

F. BYRNE

May 1986

KSC-11155**Vol. 10, No. 2, P. 42**

Circuit detects interrogation signals from air-traffic-control station and determines whether transponder of airplane should respond. Circuit examines relative magnitudes of first two pulses in three-pulse sequence of interrogation signal. On basis of relative magnitudes, circuit decides whether main lobe of interrogating radar beam is received (response should be generated) or only side lobe received (and interrogation ignored). Circuit simple and inexpensive.

B86-10103**LITHIUM-COUNTERDOPED SOLAR CELLS**

I. WEINBERG, and H. BRANDHORST

May 1986

LEW-14177**Vol. 10, No. 2, P. 43**

Resistance to damage by energetic electrons increased. Lithium-counterdoped cells produce more output power than presently-used, conventional n + p silicon cells, after irradiation by MeV electrons. In addition to possessing increased radiation resistance, lithium-counterdoped silicon solar cells show significant performance restoration when annealed at temperature of 100 degrees C. Performances compared after irradiation with 1-MeV electrons. Lithium-counterdoped solar cell offers potential for in situ annealing in space. Process increases electrical power

available from solar-cell array during use in space missions subject to degrading particulate environment of space.

B86-10104**EJECTION MECHANISM FOR CIRCUIT BOARDS**

T. L. HOUFF (Hughes Aircraft Co.), and D. SHINNO (Hughes Aircraft Co.)

May 1986

MSC-20763**Vol. 10, No. 2, P. 46**

Damage to connectors reduced and special tools not needed. Clockwise rotation of screw tightens wedges against mounting body and right heat sink. Counterclockwise rotation of screw drives bottom wedge downward and jacking ring upward, pulling pins away from mating connector. Screw in mechanism turned to produce jacking force that disengages board from mating connector. Force parallel to connector pins do not bend or brake. When disengaged, board protrudes from assembly and readily grasped by operator.

B86-10105**BROADBAND ULTRASONIC TRANSDUCERS**

R. C. HEYSER (Caltech)

May 1986

NPO-16590**Vol. 10, No. 2, P. 47**

New geometry spreads out resonance region of piezoelectric crystal. In new transducer, crystal surfaces made nonparallel. One surface planar; other, concave. Geometry designed to produce nearly uniform response over a predetermined band of frequencies and to attenuate strongly frequencies outside band. Greater bandwidth improves accuracy of sonar and ultrasonic imaging equipment.

B86-10106**CORRECTING FOR NONLINEARITY IN A PHOTODETECTOR**

R. A. SCHINDLER (Caltech)

May 1986

NPO-16055**Vol. 10, No. 2, P. 47**

Simple positive-feedback circuit varies bias voltage as necessary. Ideal detector biased with constant voltage, detector current proportional to photon flux plus constant offset. Detector connected between inverting input and ground, and feedback from operational amplifier through feedback resistor R_f make voltage at inverting input equal to noninverting input. Bias voltage held constant. Principle applied to linearizing mercury cadmium telluride infrared detectors in Fourier-transform spectrometers and other spectral and imaging instruments.

B86-10107**IMPROVED HIGH/LOW JUNCTION SILICON SOLAR CELL**

A. NEUGROSCHER (University of Florida), S. C. PAO (University of Florida), F. A. LINDHOLM (University of Florida), and J. G. FOSSUM (University of Florida)

May 1986

LEW-13618**Vol. 10, No. 2, P. 48**

Air-mass-zero open-circuit voltage increased to 650 mV. Oxide-charge-induced high/low emitter solar cell, electron accumulation layer induced by positive charge. High/low emitter suppresses dark emitter recombination current, resulting in power-conversion efficiencies significantly higher than previously achieved.

B86-10108**A 25-KW SERIES-RESONANT POWER CONVERTER**

R. J. FRYE, and R. R. ROBSON (Hughes Research Laboratories)

May 1986 See Also (N84-17481)

LEW-14197**Vol. 10, No. 2, P. 49**

Prototype exhibited efficiency of 93.9 percent. 25-kW resonant

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dc/dc power converter designed, developed, fabricated, and tested, using Westinghouse D7ST transistors as high-power switches. D7ST transistor characterized for use as switch in series-resonant converters, and refined base-drive circuit developed. Technical base includes advanced switching magnetic, and filter components, mathematical circuit models, control philosophies, and switch-drive strategies. Power-system benefits such as lower losses when used for high-voltage distribution, and reduced magnetics and filter mass realized.

B86-10197 **FABRICATION OF AN X-RAY IMAGING DETECTOR** G. E. ALCORN, and A. S. BURGESS

May 1986

GSC-12956 Vol. 10, No. 3, P. 30

X-ray detector array yields mosaic image of object emitting 1- to 30-keV range fabricated from n-doped silicon wafer. In proposed fabrication technique, thin walls of diffused n+ dopant divide wafer into pixels of rectangular cross section, each containing central electrode of thermally migrated p-type metal. This pnn+ arrangement reduces leakage current by preventing transistor action caused by pnp structure of earlier version.

B86-10198 **SELF-ALIGNING ELECTRICAL CONNECTOR** A. SWANIC (Arbus, Inc.)

May 1986

MFS-26022 Vol. 10, No. 3, P. 33

Mating pair of insulators forces initial alignment of plug and socket. Male pins recessed behind one of aligning insulators so they cannot touch female contacts aligned. Contacts mate when coupling nut draws aligned plug and socket together, depressing one of aligning insulators against spring. Compressed spring provides tension on mated threads of assembly helping connector to resist loosening under vibration or shock. Arrangement prevents breakage or bending of male pins on conventional connectors when misaligned contacts carelessly pressed together.

B86-10199 **ROM-BASED PLAN-POSITION-INDICATOR SWEEP DRIVER** J. M. FRANKE, and B. D. LEIGHTY

May 1986

LAR-13328 Vol. 10, No. 3, P. 34

Circuit produces PPI display on conventional X-Y oscilloscope. Circuit requires three inputs. First is once-per-scan pulse to synchronize display to north, relative heading, or another reference direction. Second is once-per-degree-of-rotation pulse to advance sweep rotation. Third input is normal sweep ramp. Duration of ramp corresponds to maximum displayed range. Changing ramp duration, while holding its peak amplitude constant, changes maximum displayed range. Conventional methods to accomplish this task use mechanically-driven deflection coils or mechanically-driven sine and cosine potentiometers, requiring mechanical preventive maintenance plus dedicated display indicator. New method displays radar sweep on any conventional storage oscilloscope.

B86-10200 **VARIABLE SYNTHETIC CAPACITANCE** L. L. KLEINBERG

May 1986

GSC-12961 Vol. 10, No. 3, P. 36

Feedback amplifier circuit synthesizes electronically variable capacitance. Variable Synthetic Capacitor is amplifier circuit with follower/feedback configuration. Effective input capacitance depends on input set current. If synthetic capacitor is connected across resonant element of oscillator, oscillator frequency controlled via input set current. Circuit especially suitable for fine

frequency adjustments of piezoelectric-crystal or inductor/capacitor resonant oscillators.

B86-10201 **HIGH-RESOLUTION THERMAL X-RAY DETECTOR** S. H. MOSELEY

May 1986

GSC-12953 Vol. 10, No. 3, P. 37

Thermal pulses from single photons measured. Detector, consists of X-ray absorber, temperature sensor in absorber, and thermal link from absorber to heat sink. X-ray photon detected by measuring temperature rise immediately following absorption of photon. Thermal X-ray detector, tested successfully in prototype, in theory operates as spectrometer that provides 100 times spectral resolution of conventional to detect trace constituents in materials by X-ray fluorescence. Also used for measuring energies of energetic electrons and weak pulses of light.

B86-10202 **TWO-ELEMENT TRANSDUCER FOR ULTRASOUND** D. H. LECROISSETTE (Caltech), and R. C. HEYSER (Caltech)

May 1986

NPO-16591 Vol. 10, No. 3, P. 38

Separation of transmitting and receiving units improves probing of deep tissue. Ultrasonic transducer has dual elements to increase depth at which sonic images are made of biological tissue. Transducer uses separate transmitting and receiving elements, and frequency response of receiving element independently designed to accommodate attenuation of higher frequencies by tissue. New transducer intended for pulse-echo ultrasonic systems in which reflected sound pulses reveal features in tissue.

B86-10203 **TEMPERATURE-SENSITIVE OSCILLATOR** L. L. KLEINBERG

May 1986

GSC-12958 Vol. 10, No. 3, P. 39

Ingestible thermometer consists of oscillator with temperature-dependent frequency. Device is quartz-crystal oscillator, frequency of which changes in proportion to change in temperature. Temperature-Sensitive Oscillator with nearly linear temperature coefficient of frequency obtained by using high-speed, high-gain, programmable operational amplifier such as OP-32 to produce temperature-varying reflected capacitance across quartz crystal. New, small, inexpensive, low-power, temperature-sensing circuit suitable for use as ingestible thermometer for measuring internal body temperature.

B86-10204 **MULTIKILOWATT BIPOLAR NICKEL/HYDROGEN BATTERY** (Innovator Not Given)(Electrochemistry Branch)

May 1986 See Also N82-24647/NSP

LEW-14244 Vol. 10, No. 3, P. 39

High energy densities appear feasible. Nickel/hydrogen battery utilizing bipolar construction in common pressure vessel, addressing needs for multikilowatt storage for low-Earth-orbit applications, designed and 10-cell prototype model tested Modular-concept-design 35-kW battery projected energy densities of 20 to 24 Wh/b (160 to 190 kJ/kg) and 700 to 900 Wh/ft³ (90 to 110 MJ/m³) and incorporated significant improvements over state-of-the-art storage systems.

B86-10205 **UNBALANCED-TO-BALANCED VIDEO INTERFACE** J. E. RICHARDSON (Taft Broadcasting Corp.)

May 1986

MSC-20950 Vol. 10, No. 3, P. 40

Equal but opposite video waveforms generated. Unbalanced input line terminated in 75-ohm resistor, R1. Capacitor C1 blocks dc component of input so only time-varying component fed to Q1 and inverted in polarity. Circuit intended for use with input television signal having polarity, amplitude, and dc bias such that tips of synchronizing pulses lie at zero volts while reference white level is specified positive dc level (typically about 1 volt).

B86-10206**PASSIVE ELEMENT SHAPES ANTENNA RADIATION PATTERN**

M. E. BONEBRIGHT (Cubic Corp.), and D. KILLION (Cubic Corp.)
May 1986

NPO-16632**Vol. 10, No. 3, P. 41**

Parasitic waveguide element suppresses ground-reflected multipath radiation. Small section of waveguide placed in front of phased-array antenna operating at 850 MHz modifies radiation field by reducing power density parallel to and below ground plane without significantly affecting primary radiation at angles greater than 20 degrees above horizontal. Acts as parasitic radiator that shifts phase of portion of wavefront by approximately 180 degrees, causing partial cancellation in ground plane, thereby reducing radiation intensity in that direction by about 10 dB. Produces corresponding reduction in multipath radiation scattered from ground. Waveguide technique also used to decouple two nearby antennas.

B86-10207**RELIABILITY RESEARCH FOR PHOTOVOLTAIC MODULES**

RONALD J. ROSS, JR. (Caltech)
May 1986

NPO-16595**Vol. 10, No. 3, P. 42**

Report describes research approach used to improve reliability of photovoltaic modules. Aimed at raising useful module lifetime to 20 to 30 years. Development of cost-effective solutions to module-lifetime problem requires compromises between degradation rates, failure rates, and lifetimes, on one hand, and costs of initial manufacture, maintenance, and lost energy, on other hand. Life-cycle costing integrates disparate economic terms, allowing cost effectiveness to be quantified, allowing comparison of different design alternatives.

B86-10208**GUIDELINES FOR SEU-RESISTANT INTEGRATED CIRCUITS**

D. K. NICHOLS (Caltech)
May 1986

NPO-16596**Vol. 10, No. 3, P. 42**

Paper presents recent results of continuing program for increasing resistance of integrated circuits to single-event upset (SEU). Results based on study of test data for heavy-ion SEU in more than 180 different types of devices. (Some devices perform identical functions but made by different processes.) Program also examines developments in mathematical models for SEU.

B86-10309**HYDRAULIC SHUTDOWN MONITOR**

S. T. FLEMING (Rockwell International Corp.), and D. B. HARRINGTON (Rockwell International Corp.)
Jul. 1986

MSC-20796**Vol. 10, No. 4, P. 30**

Adding switch allows inappropriate control actions to be overridden. Four-pole, double-throw switch added to front panel of controller to disable tracking-error and endpoint-error circuitry yet still retain overload-detection capability. Previously, it was necessary to use adjustable-voltage-level detection equipment connected with cables to hydraulic 'dump' or shutdown circuitry in controller.

B86-10310**CONTROLLING A FOUR-QUADRANT BRUSHLESS THREE-PHASE DC MOTOR**

F. J. NOLA
Jul. 1986

MFS-28080**Vol. 10, No. 4, P. 32**

Control circuit commutates windings of brushless, three-phase, permanent-magnet motor operating from power supply. With single analog command voltage, controller makes motor accelerate, drive steadily, or brake regeneratively, in clockwise or counterclockwise direction. Controller well suited for use with energy-storage flywheels, actuators for aircraft-control surfaces, cranes, industrial robots, and other electromechanical systems requiring bidirectional control or sudden stopping and reversal.

B86-10311**TAILORABLE INFRARED SENSING DEVICES**

L. J. CHENG (Caltech)
Jul. 1986

NPO-16607**Vol. 10, No. 4, P. 36**

Alternating layers of GeSi_{1-x} and Si deposited by molecular beam epitaxy. When electric field applied across stack, acts as detector for infrared photons. Device fabricated on silicon substrate together with sophisticated very-large-scale integrated circuitry. Useful for wide range of applications related to robotics, space exploration, and terrestrial surveillance.

B86-10312**ELECTROMETER AMPLIFIER WITH OVERLOAD PROTECTION**

F. H. WOELLER, and R. ALEXANDER (TRW, Inc.)
Jul. 1986

ARC-11457**Vol. 10, No. 4, P. 36**

Circuit features low noise, input offset, and high linearity. Input preamplifier includes input-overload protection and nulling circuit to subtract dc offset from output. Prototype dc amplifier designed for use with ion detector has features desirable in general laboratory and field instrumentation.

B86-10313**SEMICONDUCTOR LASER WITH TWO-DIMENSIONAL BEAM STEERING**

J. KATZ (Caltech)
Jul. 1986

NPO-16031**Vol. 10, No. 4, P. 37**

Modification of monolithic semiconductor injection laser capable of one-dimensional electronic beam steering enables deflection of beam in second direction. Such laser chip provides beam pointing or raster scanning for applications in optical communications, data processing, image scanning, and optical ranging.

B86-10314**MOSFET POWER CONTROLLER**

J. MITCHELL (Westinghouse Electric Corp.), and K. JONES (Westinghouse Electric Corp.)
Jul. 1986 See Also N83-21236/NSP

LEW-14112**Vol. 10, No. 4, P. 38**

High current and voltage controlled remotely. Remote Power Controller includes two series-connected banks of parallel-connected MOSFET's to withstand high current and voltage. Voltage sharing between switch banks, low-impedance, gate-drive circuits used. Provided controlled range for turn on. Individually trimmable to insure simultaneous switching within few nanoseconds during both turn on and turn off. Control circuit for each switch bank and over-current trip circuit float independently and supplied power via transformer T1 from inverter. Control of floating stages by optocouplers.

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B86-10315

FAST REMOTE KILOVOLT-POWER CONTROLLER

P. HOWER (Westinghouse Electric Corp.)

Jul. 1986 See Also N83-21236/NSP

LEW-14111

Vol. 10, No. 4, P. 42

High power turned off rapidly in case of overload. Remote power controller (RPC) developed with power-handling capability of 25 A at 1,000 Vdc. RPC has programmable characteristic that trip open to clear fault within 3 microseconds.

B86-10316

LIST OF PREFERRED ELECTRONIC PARTS

R. E. COVEY (Caltech), W. R. SCOTT (Caltech), L. M. HESS (Caltech), G. STEFFY (Caltech), and F. R. STOTT (Caltech)

Jul. 1986 See Also N86-30889/NSP

NPO-16028

Vol. 10, No. 4, P. 44

Components passed stringent qualification tests tabulated and described. Destructive and nondestructive qualification testing confirmed parts capable of withstanding spacecraft environments without excessive degradation and have stable characteristics during operating lives. Testing assessed effects of electrical, environmental, and mechanical stresses in various levels and time durations.

B86-10410

FERRORESONANT FLUX-COUPLED BATTERY CHARGER

C. W. MCLYMAN (Caltech)

Sep. 1986

NPO-16530

Vol. 10, No. 5, P.30

Portable battery charger operates at about 20 kHz to take advantage of relatively low weight and low acoustical noise of ferroresonant circuits operating in this frequency range. Charger split into stationary unit connected to powerline and mobile unit connected to battery or other load. Power transferred to mobile unit by magnetic coupling between mating transformer halves. Advantage where sparking at electrical connection might pose explosion hazard or where operator disabled and cannot manipulate plug into wall outlet. Likely applications for charger include wheelchairs and robots.

B86-10411

GAAS SEMI-INSULATING LAYER FOR A GAAS DEVICE

G. SHERRILL (University of Virginia), and R. J. MATTAUCH (University of Virginia)

Sep. 1986

NPO-16394

Vol. 10, No. 5, P. 32

Improved design for GaAs electronic device or integrated circuit designed to operate at cryogenic temperatures, customary SiO₂ insulating layer replaced by semi-insulating layer of GaAs. Thermal expansions of device and covering layer therefore match closely, and thermal stresses caused by immersion in cryogenic chamber nearly eliminated.

B86-10412

VOLTAGE REGULATORS FOR PHOTOVOLTAIC SYSTEMS

R. DELOMBARD

Sep. 1986 See Also N84-25926/NSP

LEW-13288

Vol. 10, No. 5, P. 34

Two simple circuits developed to provide voltage regulation for high-voltage (i.e., is greater than 75 volts) and low-voltage (i.e., is less than 36 volts) photovoltaic/battery power systems. Use of these circuits results in voltage regulator small, low-cost, and reliable, with very low power dissipation. Simple oscillator circuit controls photovoltaic-array current to regulate system voltage and control battery charging. Circuit senses battery (and system) voltage and adjusts array current to keep battery voltage from exceeding maximum voltage.

B86-10413

PULLING-SPEED CONTROL FOR SILICON-WEB GROWTH

R. RICHTER (Caltech)

Sep. 1986

NPO-16685

Vol. 10, No. 5, P. 35

Proposed control system for dendritic-web growth of silicon ribbons varies ribbon speed according to melt temperature. System prevents too fast or too slow withdrawal of silicon web, which cause pullout of web or excessive web thickness, respectively. System also enables semiautomatic startup of web growth by automatically increasing web speed from zero to optimum value.

B86-10414

LONG-TERM ELECTRONIC TIMER

G. TEMPLE, and T. KALASKEY

Sep. 1986

ARC-11590

Vol. 10, No. 5, P. 36

Timing circuit turns on power source on command, then turns it off again after preset interval. In comparison with prior devices, unit consumes little power and is smaller, lighter in weight, and less complicated. Timer includes oscillator and counter in integrated circuit. Timing interval equals oscillator period multiplied by number of cycles to be counted.

B86-10415

ELECTROABSORPTION INFRARED MODULATORS

D. L. ROBINSON (Caltech), W. K. MARSHALL (Caltech), and J. KATZ (Caltech)

Sep. 1986

NPO-16481

Vol. 10, No. 5, P. 38

Solid-state infrared modulator arrays fabricated and tested successfully. Arrays based on electro-absorption, and because of high speed inherent in small devices of this kind, expected to perform well at multigigahertz frequencies in such applications as multiplexing, demultiplexing, high-speed recording, and printing.

B86-10416

DUAL-SAMPLER PROCESSOR DIGITIZES CCD OUTPUT

P. M. SALOMON (Caltech)

Sep. 1986

NPO-16726

Vol. 10, No. 5, P. 40

Circuit for processing output of charge-coupled device (CCD) imager provides increased time for analog-to-digital conversion, thereby reducing bandwidth required for video processing. Instead of one sample-and-hold circuit of conventional processor, improved processor includes two sample-and-hold circuits alternated with each other. Dual-sampler processor operates with lower bandwidth and with timing requirements less stringent than those of single-sample processor.

B86-10417

PULSE-WIDTH PROPORTIONAL-CONTROLLER CIRCUIT

R. W. CLUKEY (Rockwell International Corp.)

Sep. 1986

MFS-29102

Vol. 10, No. 5, P. 43

Proportional controller for motor speed provides full 0- to 100-percent linear control of durations of motor-driving pulses. Controller uses commercially available LM3900 integrated circuit, which requires only single supply voltage of 4 to 30 V. Control voltage provided by adjustable potentiometer or by external source of feedback information such as motor-speed sensing circuit.

B86-10418

A COMBINED SCANNING CONFIGURATION FOR NEAR-FIELD ANTENNA MEASUREMENTS

Y. RAHMAT-SAMII (Caltech)

Sep. 1986

NPO-16644**Vol. 10, No. 5, P. 44**

Scanning configuration for near-field antenna measurements uses cylindrical and plane-polar coordinate surfaces to guide motions of electromagnetic-field probes. Near-field measurements needed especially to enable determination of far fields of large, low-sidelobe, multiplebeam antennas, for which application of far-field measurements often not suitable. New cylindrical/plane-polar scanning configuration requires less space, yet expected to give complete measurements with fewer mechanical complications.

B86-10419**ANTENNA QUADRIPOD WITH REDUCED BLOCKAGE**

J. J. CUCCHISSI (Caltech)

Sep. 1986

NPO-16704**Vol. 10, No. 5, P. 45**

Design study for subreflector support of 64-m-diameter paraboloidal microwave antenna described in 19-page report. Objective of study to upgrade existing antenna quadripod, subject to mechanical and electromagnetic design requirements and optimization criteria. Principal effort directed toward reducing signal blockage by quadripod legs while minimizing structural weight.

B86-10453**ANALYZING MILLIMETER-WAVE MIXERS**

P. SIEGEL, A. KERR, and W. HWANG (Columbia University)

Sep. 1986

GSC-12940**Vol. 10, No. 5, P. 90**

Series of computer programs developed to serve as tool in understanding behavior and subsequent optimization of millimeter-wave mixers. Major program in collection is general mixer-analysis program that performs complete large- and small-signal analysis of mixer with known diode and mount characteristics. Primary objective behind programs to gain better understanding of factors that affect performance of room-temperature, single-ended Schottky-diode mixers operating above 100 GHz.

B86-10481**DESIGNING DC INDUCTORS WITH AIRGAPS**

A. P. WAGNER (Caltech)

Nov. 1986

NPO-16739**Vol. 10, No. 6, P. 28**

Optimal parameters obtained designing near saturation point. New iterative procedure aids design of dc inductors with airgaps in cores. For given core area and length, technique gives design having specified inductance and peak flux density in core, using minimum required copper weight. Executed rapidly on programmable, hand-held calculator. Applications include lightweight inductors for aircraft electronics.

B86-10482**CIRCUIT FOR LIFETIME AND SURFACE-RECOMBINATION MEASUREMENTS**

F. A. LINDHOLM (University of Florida), A. NEUGROSCHER (University of Florida), and T. W. JUNG (University of Florida)

Nov. 1986

NPO-16752**Vol. 10, No. 6, P. 30**

Test circuit for silicon solar cells suppresses spurious effects. New circuit increases accuracy of measurements of recombination lifetime and effective surface recombination velocity in silicon solar cell. Fast electronic switch, circuit grounds forward-biased cell so rapidly transient voltage to be measured not affected significantly.

B86-10483**FUEL-CELL STRUCTURE PREVENTS MEMBRANE DRYING**

J. MCELROY (General Electric Co.)

Nov. 1986

MSC-21031**Vol. 10, No. 6, P. 32**

Embossed plates direct flows of reactants and coolant. Membrane-type fuel-cell battery has improved reactant flow and heat removal. Compact, lightweight battery produces high current and power without drying of membranes.

B86-10484**SOLENOID-SIMULATION CIRCUIT**

R. A. SIMON (Rockwell International Corp.)

Nov. 1986

MFS-29173**Vol. 10, No. 6, P. 35**

Electrical properties of solenoids imitated for tests of control circuits. Simulation circuit imitates voltage and current responses of two engine-controlling solenoids. Used in tests of programs of digital engine-control circuits, also provides electronic interface with circuits imitating electrical properties of pressure sensors and linear variable-differential transformers. Produces voltages, currents, delays, and discrete turnon and turnoff signals representing operation of solenoid in engine-control relay. Many such circuits used simulating overall engine circuitry.

B86-10528**GRID-OPTIMIZATION PROGRAM FOR PHOTOVOLTAIC CELLS**

R. E. DANIEL (Caltech), and T. S. LEE (Caltech)

Nov. 1986

NPO-16804**Special Edition, P. 38**

CELLOPT program developed to assist in designing grid pattern of current-conducting material on photovoltaic cell. Analyzes parasitic resistance losses and shadow loss associated with metallized grid pattern on both round and rectangular solar cells. Though performs sensitivity studies, used primarily to optimize grid design in terms of bus bar and grid lines by minimizing power loss. CELLOPT written in APL.

B87-10001**TWO-LAYER, FULL-COLOR ELECTROLUMINESCENT DISPLAY**

J. B. ROBERTSON

Jan. 1987

LAR-13407**Vol. 11, No. 1, P. 24**

Full-color, matrix-addressed electroluminescent display uses three different color phosphors located in two separate, superimposed layers to provide higher brightness, better contrast ratio, and higher resolution. Design used for such transparent, flat-panel display media as thin-film electroluminescent phosphors, liquid crystals, or light-emitting diodes.

B87-10002**PHASE-CENTER EXTENSION FOR A MICROWAVE FEED HORN**

R. W. HARTOP (Caltech), and F. MANSHADI (Caltech)

Jan. 1987

NPO-16594**Vol. 11, No. 1, P. 26**

Corrugated cylindrical tube relocates phase center of Cassegrain antenna feed. Proposed modification increases aperture of Cassegrain antenna from 64 to 70 m. Relatively inexpensive extension moves phase center of feed without incurring cost of redesigning horn and relocating low-noise equipment. Extension does not affect polarization characteristics of feed.

B87-10003**SOLAR CELLS WITH REDUCED CONTACT AREAS**

T. DAUD (Caltech), G. T. CROTTY (Caltech), A. H. KACHARE (Caltech), and J. T. LEWIS (Caltech)

Jan. 1987

NPO-16762**Vol. 11, No. 1, P. 26**

01 ELECTRONIC COMPONENTS AND CIRCUITS

Efficiency of silicon solar cells increased about 20 percent using smaller metal-contact area on silicon at front and back of each cell. Reduction in contact area reduces surface recombination velocity under contact and thus reduces reverse saturation current and increases open-circuit voltage.

B87-10004

CMOS CLOCK SYNCHRONIZER

R. B. KEPP (Martin Marietta Corp.)

Jan. 1987

ARC-11692

Vol. 11, No. 1, P. 28

Circuit synchronizes clock and gate signals within one-quarter of clock cycle. Clock synchronizer with one-quarter-cycle skew constructed from three flip-flops, three NAND gates, and inverter. In addition gate signal to which clock synchronized, circuit requires square-wave input at twice desired clock frequency.

B87-10053

ELECTRONIC POWER SWITCH FOR FAULT-TOLERANT NETWORKS

J. VOLP (The Charles Stark Draper Laboratory, Inc.)

Feb. 1987

MSC-20874

Vol. 11, No. 2, P. 18

Power field-effect transistors reduce energy waste and simplify interconnections. Current switch containing power field-effect transistor (PFET) placed in series with each load in fault-tolerant power-distribution system. If system includes several loads and supplies, switches placed in series with adjacent loads and supplies. System of switches protects against overloads and losses of individual power sources.

B87-10054

SLIDING CAPACITIVE DISPLACEMENT TRANSDUCER

B. D. BRYNER (Thiokol Corp.), and A. L. GODFREY (Thiokol Corp.)

Feb. 1987

MFS-28017

Vol. 11, No. 2, P. 20

Simple circuit replaces bridge circuit. Sliding capacitive displacement transducer, capacitance varies linearly with displacement, enables use of simple circuit based on operational amplifier instead of complicated capacitance bridge. With new circuit, transducers as small as 0.05 in. (1.3 mm) square and 0.004 in. (0.1 mm) thick have produced output-voltage changes of about 200 mV per 0.005 in. (0.13 mm) of displacement. Piston-type transducer made quite small for installation in confined spaces.

B87-10055

A SURFACE-CONTROLLED SOLAR CELL

T. DAUD (Caltech), and G. T. CROTTY (Caltech)

Feb. 1987

NPO-16430

Vol. 11, No. 2, P. 22

Open-circuit voltage and cell efficiency increased. Proposed technique for controlling recombination velocity on solar-cell surfaces provides cells of increased efficiency and open-circuit voltage. In present cells, uncontrolled surface recombination velocity degrades open-circuit voltage and efficiency. In cell using proposed technique, transparent conducting layer, insulated from cell contacts, biased to enable variable control of surface recombination velocity.

B87-10056

MONOLITHIC ISOLATED SINGLE-MODE RING LASER

T. J. KANE (Stanford University), and R. L. BYER (Stanford University)

Feb. 1987

LAR-13191

Vol. 11, No. 2, P. 22

MISER uses four-sided ring to lase nonreciprocally. Laser

concept provides very-compact, efficient, and stable source of coherent radiation. Lasers of single, very-stable frequency desirable for number of purposes. Frequency stability makes possible coherent detection of laser radiation with low-bandwidth detector, useful for communications. Allows very-high-resolution spectroscopy. Any application where desired to use laser in way microwaves used traditionally enhanced if frequency very stable.

B87-10057

CALCULATING EFFECTS OF REFLECTOR-ANTENNA DISTORTIONS

Y. RAHMAT-SAMII (Caltech)

Feb. 1987

NPO-16641

Vol. 11, No. 2, P. 24

Mathematical numerical model accurately predicts effects of systematic distortions on radiation pattern of reflector antenna. Techniques for predicting radiation patterns developed previously for reflectors with perfect surfaces and surfaces with random deviations from perfection. New model treats reflectors distorted by thermal, gravitational, and dynamic effects. Diffraction analysis of reflector antenna depends on interpolation of surface description for farfield radiation integral. Local interpolation scheme uses bicubic or higher order polynomial approximation of surface to express desired surface point in terms of nearby known surface points.

B87-10058

CONTROLLER FOR FAST-ACTING FURNACES

R. J. WILLIAMS, O. MULLINS (Lockheed Engineering and Management Services Co.), and F. GAUDIANO (Lockheed Engineering and Management Service Co.)

Feb. 1987 See Also N83-19000/NSP

MSC-20624

Vol. 11, No. 2, P. 27

Circuit slows responses of certain furnace types. Circuit output actuates external power supply, which furnishes heater power to furnace in response to furnace temperature sensed by thermocouple. Temperature control circuit suppresses temperature oscillations in rapidly responding laboratory furnaces. Ordinarily, such furnaces difficult to control because temperatures change very rapidly with changes in delivered electric power. Ordinary commercial controllers not designed to handle this kind of response.

B87-10105

VIBRATION-RESISTANT SUPPORT FOR HALIDE LAMPS

J. KISS (ILC Technology, Inc.)

Mar. 1987

MSC-20523

Vol. 11, No. 3, P. 20

Lamp envelope protected against breakage. Old and new mounts for halide arc lamp sealed in housing with parabolic reflector and quartz window. New version supports lamp with compliant garters instead of rigid brazed joint at top and dimensionally unstable finger stock at bottom.

B87-10106

IN-VACUUM DISSOCIATOR FOR ATOMIC-HYDROGEN MASERS

R. F. VESSOT (Smithsonian Institution)

Mar. 1987

MFS-26007

Vol. 11, No. 3, P. 22

Thermal control and vacuum sealing achieved while contamination avoided. Simple, relatively inexpensive molecular-hydrogen dissociator for atomic-hydrogen masers used on Earth or in vacuum of space. No air cooling required, and absence of elastomeric O-ring seals prevents contamination. In-vacuum dissociator for atomic hydrogen masers, hydrogen gas in glass dissociator dissociated by radio-frequency signal

transmitted from surrounding 3-turn coil. Heat in glass conducted away by contacting metal surfaces.

B87-10107

MEASURING THICKNESSES OF WASTEWATER FILMS

F. H. SCHUBERT (Life Systems, Inc.), and R. J. DAVENPORT (Life Systems, Inc.)

Mar. 1987

MSC-20915

Vol. 11, No. 3, P. 23

Sensor determines when thickness of film of electrically conductive wastewater on rotating evaporator drum exceeds preset value. Sensor simple electrical probe that makes contact with liquid surface. Made of materials resistant to chemicals in liquid. Mounted on shaft in rotating cylinder, liquid-thickness sensor extends toward cylinder wall so tip almost touches. Sensor body accommodates probe measuring temperature of evaporated water in cylinder.

B87-10108

TWO-RANGE ELECTRICAL THERMOMETER

W. F. BRIDGES (United Technologies Corp.)

Mar. 1987

MFS-28145

Vol. 11, No. 3, P. 24

Thermocouple and resistance thermometer expand thermometer scale. Switch thrown up to connect platinum resistance temperature detector or down to connect (platinum/rhodium)/platinum thermocouple to meter. Thermocouple integral part of platinum resistance temperature detector wiring.

B87-10109

THEORETICAL EFFICIENCIES OF MICROWAVE DIODE TRIPLERS

M. A. FRERKING (Caltech), and K. BENSON (Caltech)

Mar. 1987

NPO-16749

Vol. 11, No. 3, P. 24

Report discusses computer simulations of 300- to 900-GHz triplers using nonideal GaAs Schottky diodes operating in varistor mode. Nonlinear boundary-value problem posed by diode state equations not solved in closed form. Consequently, such computer simulations needed to optimize tripler configuration and operating conditions.

B87-10110

MOSFET'S FOR CRYOGENIC AMPLIFIERS

R. DEHAYE, and C. A. VENTRICE (Tennessee Technological University)

Mar. 1987

MFS-27111

Vol. 11, No. 3, P. 25

Study seeks ways to build transistors that function effectively at liquid-helium temperatures. Report discusses physics of metaloxide/semiconductor field-effect transistors (MOSFET's) and performances of these devices at cryogenic temperatures. MOSFET's useful in highly sensitive cryogenic preamplifiers for infrared astronomy.

B87-10159

OVERRIDING FAULTY CIRCUIT BREAKERS

RICHARD L. ROBBINS (Rockwell International Corp.), and THOMAS E. PIERSON (Ford Aerospace)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20583

Vol. 11, No. 4, P. 18

Retainer keeps power on in emergency. Simple mechanical device attaches to failed aircraft-type push/pull circuit breaker to restore electrical power temporarily until breaker replaced. Device holds push/pull button in closed position; unnecessary for crewmember to hold button in position by continual finger pressure.

Sleeve and plug hold button in, overriding mechanical failure in circuit breaker. Windows in sleeve show button position.

B87-10160

INTEGRATED OPTICAL PROCESSOR

WILLIAM E. STEPHENS (TRW, Inc.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16684

Vol. 11, No. 4, P. 18

Images processed rapidly in rugged, compact device. Conceptual integrated optical image processor performs complicated analog calculations, including Fourier transforms, convolutions, correlations, and matrix multiplications. Compact and rugged on account of monolithic structure, processor faster than equivalent all-electronic devices because calculations require only time for light to travel across device; processing speed limited by electronic input and output circuits.

B87-10161

INJECTION PHASE-LOCKED LASER-DIODE ARRAY

JAMES R. LESH (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16542

Vol. 11, No. 4, P. 19

Phase-coherent emission with negligible far-field supermodes produced by proposed surface-emitting laser-diode array stimulated by holographically directed emission from single master diode. To achieve same coherence and output power, single laser diode requires high power density, which substantially reduces working lifetime. Proposed integrated optical array useful in communications.

B87-10162

IMPROVING SOLAR CELLS WITH POLYCRYSTALLINE SILICON

AJEET ROHATGI (Westinghouse Electric Corp.), ROBERT B. CAMPBELL (Westinghouse Electric Corp.), and PROSENJIT RAI-CHOUDHURY (Westinghouse Electric Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16820

Vol. 11, No. 4, P. 20

In proposed solar-cell design, layers of polycrystalline silicon grown near front metal grid and back metal surface. Net electrical effect increases open-circuit voltage and short-circuit current, resulting in greater cell power output and energy conversion efficiency. Solar-cell configuration differs from existing one in that layers of doped polycrystalline silicon added to reduce recombination in emitter and back surface field regions.

B87-10163

PRESSURE-TRANSDUCER SIMULATOR

RICHARD A. SIMON (Rockwell International Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29169

Vol. 11, No. 4, P. 21

Simulation circuit operates under remote, automatic, or manual control to produce electrical outputs similar to pressure transducer. Specific circuit designed for simulations of Space Shuttle main engine. General circuit concept adaptable to other simulation and control systems involving several operating modes. Switches and amplifiers respond to external control signals and panel control settings to vary differential excitation of resistive bridge. Output voltage or passive terminal resistance made to equal pressure transducer in any of four operating modes.

01 ELECTRONIC COMPONENTS AND CIRCUITS

B87-10185

SMALL-SIGNAL AC ANALYSIS

JAMES M. JAGIELSKI (Goddard Space Flight Center), and JESS CHEN (Lockheed Missile and Space Co.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13049

Vol. 11, No. 4, P. 48

Program simulates power circuits and systems. Small Signal A.C. Analysis program (SSAC) valuable tool for design and analysis of electrical-power-system circuits. By combining 'black box' power-system components operating in specified manner, user characterizes system modeled. Menu-driven program proved simple and cost effective in development and modification of arbitrary power-system configurations. Package includes sample data from Dynamic Explorer satellite family. Results compared favorable to calculations from such general circuit-analysis programs as SPICE. Written in FORTRAN 77.

B87-10212

TRANSFORMERLESS DC-ISOLATED CONVERTER

WALLY E. RIPPEL (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16141

Vol. 11, No. 5, P. 20

Efficient voltage converter employs capacitive instead of transformer coupling to provide dc isolation. Offers buck/boost operation, minimal filtering, and low parts count, with possible application in photovoltaic power inverters, power supplies and battery charges. In photovoltaic inverter circuit with transformerless converter, Q2, Q3, Q4, and Q5 form line-commutated inverter. Switching losses and stresses nil because switching performed when current is zero.

B87-10213

THERMAL AND ELECTRICAL RECHARGING OF SODIUM/SULFUR CELLS

ROBERT RICHTER (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16139

Vol. 11, No. 5, P. 22

Efficiency as high as 60 percent achieved. Proposed thermal and electrical recharging scheme expected to increase overall energy efficiency of battery of sodium/sulfur cells (beta cells). Takes advantage of peculiarity in chemical kinetics of recharge portion of operating cycle to give thermal assist to electrically driven chemical reactions. Future application include portable power supplies and energy storage in commercial power systems during offpeak periods.

B87-10214

DESIGN PRINCIPLES FOR NICKEL/HYDROGEN CELLS AND BATTERIES

LAWRENCE H. THALLER, MICHELLE A. MANZO, and OLGA D. GONZALEZ-SANABRIA

May 1987 Additional information available through: NTIS, Springfield, VA 22161, (Tel: 703-487-4650) (N85-31646/NSP)

LEW-14389

Vol. 11, No. 5, P. 24

Individual-pressure-vessel (IPV) nickel/hydrogen cells and bipolar batteries developed for use as energy-storage subsystems for satellite applications. Design principles applied draw upon extensive background in separator technology, alkaline-fuel-cell technology and several alkaline-cell technology areas. Principals are rather straightforward applications of capillary-force formalisms, coupled with slowly developing data base resulting from careful post-test analyses. Based on preconceived assumptions relative to how devices work and how to be designed so they display longer cycle lives at deep discharge.

B87-10215

PULSE TEST OF COIL INSULATION

RALPH E. KROY (Rockwell International Corp.)

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29236

Vol. 11, No. 5, P. 25

Waveform of back-electromotive force reveals defects. Simple pulse test reveals defects in inductor coils. Devised for use on servovalve solenoid coils on Space Shuttle, test also applicable to transformer windings, chokes, relays, and the like.

B87-10259

REAL-TIME SIMULATION CLOCK

DONALD R. BENNINGTON

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13615

Vol. 11, No. 6, P. 20

Fiber-optic network delivers time signals to widely separated simulator sites. Real-time digital flight simulation used to support variety of research programs. Majority of research involves man-in-the-loop simulation requiring interconnection of digital computers, simulation cockpits, control consoles, graphics subsystems, and related equipment. Real-time simulation subsystem consists of several CYBER(R) computers and over 20 simulation sites. Allows for several simultaneous simulation jobs on one CYBER(R) as well as any combination of sites in each integrated simulation job.

B87-10260

RADIAL/AXIAL MICROWAVE POWER DIVIDER/COMBINER

VERRIAH P. VADDIPARTY (Ford Aerospace and Communications Corp.)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16966

Vol. 11, No. 6, P. 22

Parts made on printed-circuit boards. Impedance-matching and power-dividing transmission-line strips formed on insulation disks and on board by printed-circuit techniques. Power from input transmission line sent equally through radial output conductors to radial output transmission lines and/or coupled in varying degrees to axial output transmission line.

B87-10261

BREAKDOWN-RESISTANT RF CONNECTORS FOR VACUUM

EDWARD R. CARO (Caltech), and WALTER J. BONAZZA (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16764

Vol. 11, No. 6, P. 23

Resilient inserts compensate for insulation shrinkage. Coaxial-cable connector for radio-frequency (RF) energy resists electrical breakdown in vacuum. Used on RF equipment in vacuum chambers as well as in spaceborne radar and communication gear.

B87-10262

CCD MEMORY

JAMES R. JANESICK (Caltech), TOM ELLIOT (Caltech), DAVE NORRIS (Caltech), and FRED VESCELUS (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16150

Vol. 11, No. 6, P. 24

CCD memory device yields over 6.4×10 to the eighth power levels of information on single chip. Charge-coupled device (CCD) demonstrated to operate as either read-only-memory (ROM) or

photon-programmable memory with capacity of 640,000 bits, with each bit capable of being weighted to more than 1,000 discrete analog levels. Larger memory capacities now possible using proposed approach in conjunction with CCD's now being fabricated, which yield over 4×10 to the ninth power discrete levels of information on single chip.

B87-10263**CONTROLLER FOR A HIGH-POWER, BRUSHLESS DC MOTOR**
DAVID J. FLEMING (Martin Marietta), and TERENCE A. MAKDAD (Martin Marietta)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28168**Vol. 11, No. 6, P. 25**

Driving and braking torques controllable. Control circuit operates 7-kW, 45-lb-ft (61-N-m), three-phase, brushless dc motor in both motor and generator modes. In motor modes, energy from power source is pulse-width modulated to motor through modified 'H-bridge' circuit, in generator mode, energy from motor is pulse-width modulated into bank of load resistors to provide variable braking torques. Circuit provides high-resolution torque control in both directions over wide range of speeds and torques. Tested successfully at bus voltages up to 200 Vdc and currents up to 45 A.

B87-10264**OSCILLATOR OR AMPLIFIER WITH WIDE FREQUENCY RANGE**

L. KLEINBERG, and J. SUTTON

Jun. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

GSC-12960**Vol. 11, No. 6, P. 26**

Inductive and capacitive effects synthesized with feedback circuits. Oscillator/amplifier resistively tunable over wide frequency range. Feedback circuits containing operational amplifiers, resistors, and capacitors synthesize electrical effects of inductance and capacitance in parallel between input terminals. Synthetic inductance and capacitance, and, therefore, resonant frequency of input admittance, adjusted by changing potentiometer setting.

B87-10265**MORE ABSTRACTS ON EFFECTS OF RADIATION ON ELECTRONIC DEVICES**

FRANK L. BOUQUET (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16959**Vol. 11, No. 6, P. 27**

Second volume of bibliography summarizes literature on radiation effects on new electronic devices. Includes those of protons, electrons, neutrons, gamma rays, and cosmic rays at energies up to about 20 GeV. Volume contains 219 abstracts from unclassified sources. Organized into four sections: dose-rate effects, new technology, post-irradiation effects, and test environments.

B87-10306**MEASURING CONDUCTOR WIDTHS AND SPACINGS ELECTRICALLY**

MARTIN G. BUEHLER (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16021**Vol. 11, No. 7, P. 22**

Widths and spacings of conductor lines on integrated circuits measured electrically by split cross-bridge resistor technique. Speeds evaluation of integrated-circuit fabrication processes. When

measurement of probe currents and voltages and reduction of measurement data automated, test structure probed and characterized in less than one second.

B87-10307**ATTACHING COPPER WIRES TO MAGNETIC-REED-SWITCH LEADS**

RUDOLF KAMILA (Consolidated Controls Corp.)

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20675**Vol. 11, No. 7, P. 24**

Bonding method reliably joins copper wires to short iron-alloy leads from glass-encased dry magnetic-reed switch without disturbing integrity of glass-to-metal seal. Joint resistant to high temperatures and has low electrical resistance.

B87-10308**HIGHLY STABLE MICROWAVE RESONATOR**

DONALD M. STRAYER (Caltech), SARITA THAKOOR (Caltech), G. JOHN DICK (Caltech), and JAMES E. MERCEREAU (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16663**Vol. 11, No. 7, P. 25**

Superconducting walls on sapphire-filled cavity make low-loss device. Improved microwave resonant cavity consists of sapphire cylinder coated with thin film of superconducting lead. Operated well below superconducting transition temperature at 1.5K, cavity demonstrated superior frequency stability and quality factor. Cavity frequency highly stable and therefore suitable for use in standard frequency generators and filters.

B87-10309**ELECTRONICALLY TUNED MICROWAVE OSCILLATOR**

MYSORE LAKSHMINARAYANA (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16836**Vol. 11, No. 7, P. 28**

Features include low phase noise and frequency stability. Bias-tuned, low-phase-noise microwave oscillator circuit based on npn bipolar transistor and dielectric resonator. Operating at frequency of about 8.4 GHz, oscillator adjusted to give low phase noise, relatively flat power output versus frequency, and nearly linear frequency versus bias voltage.

B87-10310**SWITCHING CIRCUIT REGULATES SOLENOID CURRENT**

RICHARD A. SIMON (Rockwell International Corp.)

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-19904**Vol. 11, No. 7, P. 29**

New circuit requires no heat sink and is compact. Parts cost no more than those of linear regulator. Switching regulator repeatedly causes solenoid current to build up to maximum level, then to decay to minimum level: thus current ripples about commanded intermediate level. FET's dissipate significant amounts of power only during brief turn-on and turn-off intervals.

B87-10311**ELECTRONICALLY CONTROLLED RESISTOR BANK**

WALTER L. ROSS (Rockwell International Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29149**Vol. 11, No. 7, P. 30**

Resistance quickly varied in small steps over wide range. Device

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with no moving parts provides variable electrical resistance. Used with analog or digital circuitry to provide electronic selection of large number of resistance values for testing, simulation, control, or other purposes. Nearest electromechanical equivalent of all-electronic device is potentiometer driven by servomotor.

B87-10312 **COMPUTERIZED TORQUE CONTROL FOR LARGE DC MOTORS**

RICHARD M. WILLETT (Martin Marietta Corp.), MICHAEL J. CARROLL (Martin Marietta Corp.), and RONALD V. GEIGER (Martin Marietta Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28169 Vol. 11, No. 7, P. 30

Speed and torque ranges in generator mode extended. System of shunt resistors, electronic switches, and pulse-width modulation controls torque exerted by large, three-phase, electronically commutated dc motor. Particularly useful for motor operating in generator mode because it extends operating range to low torque and high speed.

B87-10313 **FM-TO-DIGITAL CONVERTER** MICHAEL MONIUSZKO

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11172 Vol. 11, No. 7, P. 32

Circuit includes array of low-cost multivibrators. Inexpensive circuit converts frequency-modulated (FM) signal into digital signal. Consists of zero-crossing detector and series of monostable multivibrators and D-type flip-flops. Used to control filter.

B87-10314 **ZNSE FILMS IN GAAS SOLAR CELLS**

RAM H. KACHARE (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16900 Vol. 11, No. 7, P. 34

ZnSe increases efficiency and conserves material. Two proposed uses of zinc selenide films promise to boost performance and reduce cost of gallium arsenide solar cells. Accordingly ZnSe serves as surface-passivation layer and as sacrificial layer enabling repeated use of costly GaAs substrate in fabrication.

B87-10315 **MORE ON EFFECTS OF RADIATION ON ELECTRONICS** FRANK L. BOUQUET (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17019 Vol. 11, No. 7, P. 35

Third volume in series of bibliographies on radiation effects on electronics covers years 1982 and 1983. Volume summarizes literature on effects of total doses of radiation and of test environments.

B87-10374 **TESTER FOR MULTIPLE-CONDUCTOR CABLES**

MANFRED N. WIRTH, and LARRY KELLOGG (Bendix Field Engineering Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11569 Vol. 11, No. 8, P. 16

Portable testing circuit enables technician to determine quickly wiring errors in multiple-conductor electrical cable or terminal connectors. Active unit tester made of inexpensive integrated circuits and other readily available components. Timer and one-shot generate pulses counted by shift registers. Shift-register output terminals wired to connector pins so voltage applied to each pin in sequence.

B87-10375 **MEASURING LEAKAGE IN A PRESSURIZED-FLUID LOOP** BRIAN D. CLARKE (Management and Technical Services Co.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11592 Vol. 11, No. 8, P. 20

Technique applied to systems with inaccessible parts and connections. Fluid added to system by fluid-injection assembly to make up for leakage. Amount required to restore pressure in system is measure of leakage rate.

B87-10376 **ENERGY-SAVING RAM-POWER TAP**

ALAN ROY BRUNER (Sperry Corp.)

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13515 Vol. 11, No. 8, P. 21

Reverse-flow HEXFET(R) minimizes voltage drop and power dissipation. HEXFET(R) scheme reduces voltage drop by approximately 80 percent. Design for power tap for random-access memory (RAM) has potential application in digital systems.

B87-10377 **POWER-SWITCHING CIRCUIT**

GERALD A. PRAVER (Caltech), PETER C. THEISINGER (Caltech), and JOHN GENOFSKY (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16874 Vol. 11, No. 8, P. 21

Functions of circuit breakers, meters, and switches combined. Circuit that includes power field-effect transistors (PFET's) provides on/off switching, soft starting, current monitoring, current tripping, and protection against overcurrent for 30-Vdc power supply at normal load currents up to 2 A. Has no moving parts.

B87-10378 **MODIFIED-EDGE COMPACT-RANGE MEASUREMENT SYSTEM** MELVIN C. GILREATH, and WALTER D. BURNSIDE (Ohio State University)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13352 Vol. 11, No. 8, P. 24

Large curved edge termination reduces edge-scattered field in target area by one order of magnitude. Large, curved-edge treatment, involves radius of curvature equal to or greater than focal distance, provides improvement by creating reflected field that goes smoothly from parabolic surface to curved surface termination. Concept used on any reflector configuration requiring creation of field without diffraction from edge terminations.

B87-10379 **GRAPHITE MULTISTAGE DEPRESSED COLLECTOR FOR MICROWAVE TUBES**

BEN T. EBIHARA

Sep. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-13643/NSP)

LEW-14098**Vol. 11, No. 8, P. 29**

Electron backstreaming reduced. Significant increase in overall efficiency of traveling-wave tubes (TWT's) brought about by conception and development of multistage depressed collector (MDC).

B87-10380**SIMPLE, INEXPENSIVE SERVOAMPLIFIER**

H. DOUGLAS GARNER

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13538**Vol. 11, No. 8, P. 30**

Circuit based on consumer-market audio-amplifier chip. Stereo audio amplifier chip, connected as servoamplifier, supplies more than 1 A to motor. Amplifier used in analog configuration to supply proportional torque to motor, simpler circuits and more efficient use of energy result when utilized in pulse-width-modulation mode. Pulse-width signals generated directly by computer software or external pulse-width-modulation generator.

B87-10381**OSCILLATOR WITH LOW PHASE NOISE**

LEONARD L. KLEINBERG

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13018**Vol. 11, No. 8, P. 30**

Phase errors cancelled for high frequency stability. Radio-frequency oscillator achieves high stability of frequency through parallel, two-amplifier configuration in which effects cause phase noise tend to cancel each other. Circuit includes two amplifiers with resonating elements, each constitutes part of feedback loop of other. Generate same frequency because each circuit provides other with conditions necessary for oscillation.

B87-10382**CLIPPER FOR HIGH-IMPEDANCE CURRENT-DRIVE LINE**

CHRISTOPHER E. WOODHOUSE

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13069**Vol. 11, No. 8, P. 31**

New circuit leakage reduced by shunting current through saturated input at operational-amplifier follower already part of Howland, or equivalent, current source. Typical application is in circuit of germanium resistance thermometer in cryogenic system.

B87-10383**ELECTRON-FOCUS ADJUSTMENT FOR PHOTO-OPTICAL IMAGERS**

WALTER B. FOWLER, KEITH FLEMMING, and MICHAEL M. ZIEGLER

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12890**Vol. 11, No. 8, P. 32**

Internal electron focus made independent of optical focus. Procedure enables fine tuning of internal electron-focusing system of photo-optical imager, without complication by imperfections of associated external optics. Applicable to imager in which electrons emitted from photocathode in optical focal plane, then electrostatically and/or magnetically focused to replica of image in second focal plane containing photodiodes, phototransistors, charge-coupled devices, multiple-anode outputs, or other detectors.

B87-10441**IMPROVED FLUX-GATE MAGNETOMETER**

H. DOUGLAS GARNER

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13560**Vol. 11, No. 9, P. 24**

Simplified circuit drives heading indicator and senses magnetic field of Earth. Simple flux-gate magnetometer supplies digital readout of magnetic heading of vehicle, developed to drive heading indicator, or supply heading information to autopilot or to other navigational instruments. Important feature is core driven into saturation in one direction only by alternating drive voltage, which swings from zero to one polarity and back. Made in part of commercially available integrated circuits.

B87-10442**SELF-STABILIZING STORAGE LOOPS FOR MAGNETIC-BUBBLE MEMORIES**

GARY L. NELSON (Sperry Corp.)

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-22525)

LAR-13625**Vol. 11, No. 9, P. 28**

Adjacent, sinusoidal loops provide defect-tolerant, self-stabilizing structures. New technology consists of three components providing self-stabilizing structures. First, apertures positioned so bubbles propagate alternately into hexagonally related positions and directly opposed positions; addition of straight barriers by ion milling or implantation of garnet adds transverse stability but leaves longitudinally metastable positions. Second, modification of barrier to sinusoidal shape provides 'energy wells' in longitudinal direction at opposed positions and eliminates metastability. Third, positioning and phasing of counterrotating storage loops, provide stable hexagonal support between adjacent loops.

B87-10443**DIODE STRUCTURE FOR MICROWAVE AND INFRARED APPLICATIONS**

GEORGE ALCORN, CHARLES LEINTERAN, and BING CHIANG

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12962**Vol. 11, No. 9, P. 30**

Microwave signals switched or modulated optically. Planar diode with transparent cathode made in BaAs, Si, and InSb versions. Depending on specific configuration and material, such diode used for optical modulation of microwave signal or as infrared detector. Transparent cathode fabricated on GaAs diode so diode illuminates to generate and control short-circuit current.

B87-10444**HIGH-VOLTAGE SWITCH CONTAINING (DI)₂ DEVICES**

MAURICE H. HANES (Westinghouse Electric Corp.), and RICHARD J. FIEDOR (Westinghouse Electric Corp.)

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-20246/NSP and N86-30073/NSP)

LEW-14390**Vol. 11, No. 9, P. 32**

Series switching diodes triggered on by passing above threshold voltage. High-voltage switch made by connecting multitude of deep-impurity, double-injection devices in series with each other and with another, triggerable high-voltage device such as thyristor. Device operates near ground potential to avoid insulation problems in triggering circuit.

B87-10445**IMPLANTABLE, INGESTIBLE ELECTRONIC THERMOMETER**

LEONARD KLEINBERG

Oct. 1987 Additional information available through: NASA STI

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Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13037

Vol. 11, No. 9, P. 34

Small quartz-crystal-controlled oscillator swallowed or surgically implanted provides continuous monitoring of patient's internal temperature. Receiver placed near patient measures oscillator frequency, and temperature inferred from previously determined variation of frequency with temperature. Frequency of crystal-controlled oscillator varies with temperature. Circuit made very small and implanted or ingested to measure internal body temperature.

B87-10446

WAVEGUIDE-HORN-TO-WAVEGUIDE TRANSITION ASSEMBLY
SHAYLA E. DAVIDSON, ROLAND W. SHAW (Lockheed Corp.),
JEFFERY K. KOVITZ (Lockheed Corp.), GEORGE W. RAFFOUL
(Lockheed Corp.), and LARRY A. JOHNSON (Lockheed Corp.)

Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21146

Vol. 11, No. 9, P. 34

Microstrip-to-waveguide transition integrated with waveguide-horn antenna element. Integrated transition assembly couples electromagnetic energy through horn and transition board to connector.

B87-10447

DIFFRACTION ANALYSIS OF ANTENNAS WITH MESH SURFACES

YAHYA RAHMAT-SAMII (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16474

Vol. 11, No. 9, P. 36

Strip-aperture model replaces wire-grid model. Far-field radiation pattern of antenna with mesh reflector calculated more accurately with new strip-aperture model than with wire-grid model of reflector surface. More adaptable than wire-grid model to variety of practical configurations and decidedly superior for reflectors in which mesh-cell width exceeds mesh thickness. Satisfies reciprocity theorem. Applied where mesh cells are no larger than tenth of wavelength. Small cell size permits use of simplifying approximation that reflector-surface current induced by electromagnetic field is present even in apertures. Approximation useful in calculating far field.

B87-10448

ANALYSIS OF A FOUR-REFLECTOR S/X-BAND ANTENNA

ALAN G. CHA (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16839

Vol. 11, No. 9, P. 40

Physical optics accounts for near field, cross polarization, and higher-order modes. Report presents physical-optics analysis of four-reflector, 64-m antennas of Deep Space Network. Analysis thorough and detailed. Report has instructional value as example for designers of large microwave dishes with subreflectors and involving reflector surfaces with hyperboloidal, paraboloidal, ellipsoidal, and more complex shapes.

B87-10511

DIFFRACTIVELY COUPLED, REFRACTIVELY GUIDED LASERS
JOSEPH KATZ (Caltech), JIM CSER (Caltech), and WILLIAM K. MARSHALL (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16927

Vol. 11, No. 10, P. 24

Semiconductor-laser arrays more reliable, more powerful, and easier to make. Improved design intended to eliminate undesired electromagnetic modes and mode shifts sometimes occurring in gain-guided variety. Reflected from mirror/window at end of common resonator section of laser, energy refracted from each laser enters adjacent laser. Mutual coupling establishes phase relationships among lasers. Monolithic laser array made by standard epitaxial techniques. Made in part with polymeric materials to mitigate some deleterious effects of all-epitaxial processing. Potential applications include optical communications, ranging, printing, and recording.

B87-10512

TEMPERATURE-CONTROLLING CIRCUIT

GERALD TEMPLE

Nov. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11707

Vol. 11, No. 10, P. 28

Simple circuit switches current to electrical heater on and off to maintain temperature of room at 25 plus or minus 0.5 degree C. Lightweight, compact, reliable, insensitive to electrical noise, and uses single 5-Vdc power supply. Handles ac loads of 10 A. Designed to operate outside temperature controlled environment over range of -55 to +85 degree C. Thermistor provides input signal for simple temperature controller. Output of controller applied to solid-state relay, which in turn switches current to resistance heater.

B87-10513

LONG-LIFE ELECTROLYTE FOR NICKEL/HYDROGEN CELLS

H. S. LIM (Hughes Aircraft Co.), and S. A. VERZWYVELT (Hughes Aircraft Co.)

Nov. 1987 Additional information available through: AIAA Technical Information Service Library 555 West 57th Street, New York, NY 10019 (Tel: 212-247-6500) (A86-24802)

LEW-14301

Vol. 11, No. 10, P. 30

Experiments show surprisingly substantial increase of cycle life of nickel/hydrogen cells when KOH concentration in electrolytes decreased from industry standard of 31 percent, while life decreased when concentration increased. Particularly important in view of prior recommendation to increase concentration to increase cell capacity. Benefit of increase of cycle life as concentration decreased is expected to outweigh reduction of capacity at beginning of life.

B87-10514

RELIABLE WIRING HARNESS

KENNETH C. GASPAR (Rockwell International Corp.)

Nov. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29192

Vol. 11, No. 10, P. 32

New harness for electrical wiring includes plugs that do not loosen from vibration. Ground braids prevented from detaching from connectors and constrained so braids do not open into swollen 'birdcage' sections. Spring of stainless steel encircles ground braid. Self-locking connector contains ratchet not only preventing connector from opening, but tightens when vibrated.

B87-10515

EXTENSION OF SUBREFLECTOR INCREASES ANTENNA EFFICIENCY

Y. RAHMAT-SAMII (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16872

Vol. 11, No. 10, P. 34

According to calculations, efficiency of offset Cassegrain reflector antenna increased by about 8 percent by extending edge

of subreflector outward about 1 wavelength beyond optical limit. Even though main reflector partially shadowed by subreflector, partial aperture blockage more than offset by consequent reduction of diffraction on subreflector. Similar conclusions apply to symmetric Cassegrain antennas.

B87-10516

DUAL-ENERGY X-RADIOGRAPHY WITH GADOLINIUM FILTER

BRIAN RUTT (University of California at San Francisco)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16773

Vol. 11, No. 10, P. 36

Image resolution increased, and cost reduced. Proposed dual-energy x-ray imaging system, continuous bremsstrahlung spectrum from x-ray tube filtered by foil of nonradioactive gadolinium or another rare-earth metal to form two-peaked energy spectrum. After passing through patient or object under examination, filtered radiation detected by array of energy-discriminating, photon-counting detectors. Detector outputs processed to form x-ray image for each peak and possibly enhanced image based on data taken at both peaks.

B87-10517

TUNABLE DUAL SEMICONDUCTOR LASER

SEIJI MUKAI (Caltech), ELI KAPON (Caltech), JOSEPH KATZ (Caltech), SHLOMO MARGALIT (Caltech), and AMNON YARIV (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16374

Vol. 11, No. 10, P. 36

Parallel lasers interact in shared space to alter output wavelength. New device consists of two stripe lasers in aluminum gallium arsenide chip. Parallel stripes close enough so light from lower laser coupled into upper laser and vice versa. Lasers operated by low-duty-cycle current pulses. Lasing threshold of each about 100 mA. Currents controlled independently. Useful in optical communications systems employing wavelength-division multiplexing.

B87-10534

DESIGNING RECTANGULAR RHCP MICROSTRIP ANTENNAS

SHAYLA E. DAVIDSON

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21180

Vol. 11, No. 10, P. 56

RHCP, Right-Handed, Circularly Polarized Microstrip Antenna program, aids in design of rectangular microstrip-antenna element, given desired frequency of operation and characteristics of substrate. Begins design calculations on basis of square element with linear polarization. Effective dielectric constant and changes in electrical length due to fringing at edges of radiating element taken into account. Coaxial feed inset with 50 ohms input impedance. Placement of feed such that two orthonormal modes produced in antenna cavity, right- or left-handed circular polarization obtained. Written in FORTRAN 77.

B87-10535

PCACE-PERSONAL-COMPUTER-AIDED CABLING ENGINEERING

JOSEPH W. BILLITTI (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17006

Vol. 11, No. 10, P. 56

PCACE computer program developed to provide inexpensive,

interactive system for learning and using engineering approach to interconnection systems. Basically database system that stores information as files of individual connectors and handles wiring information in circuit groups stored as records. Directly emulates typical manual engineering methods of handling data, thus making interface between user and program very natural. Apple version written in P-Code Pascal and IBM PC version of PCACE written in TURBO Pascal 3.0

B87-10536

ASSESSMENT OF ADVANCED CONCENTRATOR PHOTOVOLTAIC MODULES

C. S. BORDEN (Caltech), D. L. SCHWARTZ (Caltech), and M. C. DAVISSON (Apogee Computer Designs, Inc.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17042

Vol. 11, No. 10, P. 58

Computer program developed to estimate probabilistically total and component costs to end users of concentrating photovoltaic arrays in 1990's. Based on modified version of SIMRAND program, Simulation of Research and Development projects, -to estimate total cost of system for large number of module designs. Module design that yields minimum cost for total system then chosen as preferred design. To obtain distribution of expected module costs, simulation performed. Component estimates made by SIMRAND include efficiency of module and costs of cell, assembly of cells, lenses, and modules. Written in FORTRAN 77.

B87-10537

CALCULATING ELECTROMAGNETIC FIELDS OF A LOOP ANTENNA

MITCHELL B. SCHIEFFER (McDonnell Douglas Corp.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21110

Vol. 11, No. 10, P. 58

Approximate field values computed rapidly. MODEL computer program developed to calculate electromagnetic field values of large loop antenna at all distances to observation point. Antenna assumed to be in x-y plane with center at origin of coordinate system. Calculates field values in both rectangular and spherical components. Also solves for wave impedance. Written in MicroSoft FORTRAN 77.

B88-10001

ADJUSTABLE, AUDIBLE CONTINUITY TESTER FOR DELICATE CIRCUITS

WILLIAM B. MCALISTER

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13102

Vol. 12, No. 1, P. 18

Unit adjustable to resistances up to 35 ohms. Adjustable, audible electrical-continuity tester gives audible indication. Used safely on circuit boards in which semiconductor components installed, and on complementary metal oxide/semiconductor integrated circuits. Tester compact and circuit simple. Built from inexpensive standard components.

B88-10002

OPTICAL ROTARY JOINT FOR DATA TRANSFER

FRED J. BECKER (McDonnell Douglas Corp.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21182

Vol. 12, No. 1, P. 20

Proposed joint increases bandwidth and reduces errors. Scheme for transferring digital data across rotary joint uses light instead of

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electrical signals. Optical joint offers greater bandwidth and operates at considerably lower error rate. Concept applied to transfer of highspeed data to rotating antennas or across joints of robots and manipulators in automated manufacturing.

B88-10003

ARC-JET POWER SUPPLY AND STARTING CIRCUIT

ROBERT P. GRUBER

Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-25409/NSP)

LEW-14374 Vol. 12, No. 1, P. 22

Power efficiency high, current regulated, and starting automatic. New circuit for starting arc jets and controlling them in steady operation capable of high power efficiency and constructed in lightweight form. Feedback control system keeps arc-jet current nearly constant, once arc struck by starting pulse. Circuit made of commercially available components. Design capable of high power efficiency.

B88-10004

DIFFERENCE-EQUATION/FLOW-GRAPH CIRCUIT ANALYSIS

I. M. MCVEY (Rockwell International Corp.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29245 Vol. 12, No. 1, P. 23

Numerical technique enables rapid, approximate analyses of electronic circuits containing linear and nonlinear elements. Practiced in variety of computer languages on large and small computers; for circuits simple enough, programmable hand calculators used. Although some combinations of circuit elements make numerical solutions diverge, enables quick identification of divergence and correction of circuit models to make solutions converge.

B88-10005

DUAL-BAND MICROSTRIP ANTENNA WITH REACTIVE LOADING

SHAYLA E. DAVIDSON

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21118 Vol. 12, No. 1, P. 26

Effective but bulky coaxial stub replaced. Short-circuited microstrip transmission line serves as reactive loading element for microstrip antenna. Constructed integrally with stripline radiating element, shorted line preserves low microstrip profile and enables tuning of antenna for two-band operation.

B88-10006

WIDE-BAND, WIDE-SCAN ANTENNA FOR CIRCULAR POLARIZATION

JOHN HUANG (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16831 Vol. 12, No. 1, P. 26

Circular polarization generated by linearly polarized elements. Basic two-by-two subarray of antenna elements made of microstrip patches. Patches arranged in orthogonal pattern. Fed through different phase shifters so signal at feed points have same orthogonal relationship in phase. Antennas of this general type useful in communications and phased-array radar.

B88-10007

COATINGS BOOST SOLAR-CELL OUTPUTS

AJEET ROHATGI (Westinghouse Electric Corp.), ROBERT B.

CAMPBELL (Westinghouse Electric Corp.), T. W. O'KEEFE (Westinghouse Electric Corp.), POSENJIT RAI-CHOUDHURY (Westinghouse Electric Corp.), and RICHARD A. HOFFMAN (Westinghouse Electric Corp.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16819 Vol. 12, No. 1, P. 27

Efficiencies increased by more-complete utilization of incident light. Electrical outputs of thin solar photovoltaic cells made of dendritic-web silicon increased by combination of front-surface, antireflective coatings and back-surface, reflective coatings. Improvements achieved recently through theoretical and experimental studies of ways to optimize coatings for particular wavelengths of incident light, cell thicknesses, and cell materials.

B88-10008

COMPACT SUN-POSITION SENSOR

YUTAKA MATSUMOTO, and CESAR MINA

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11696 Vol. 12, No. 1, P. 30

Single device finds and tracks Sun. New sensor has both wide field of view and high angular resolution when axis within few degrees of the line to the Sun.

B88-10009

DESIGNING A MICROWAVE BAND-STOP FILTER

F. MANSHADI (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16945 Vol. 12, No. 1, P. 32

Lumped-circuit design techniques applied to iris-coupled cavities. Waveguide/cavity filter imitates lumped series and parallel combinations of inductance and capacitance over narrow stopband centered at 7.190 GHz. Filter made of standard WR125 waveguide stock.

B88-10010

ELECTRONIC NEURAL-NETWORK SIMULATOR

ALEX W. MOOPENN (Caltech), ANILKUMAR P. THAKOOR (Caltech), and JOHN J. LAMBE (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17058 Vol. 12, No. 1, P. 35

Experimental circuits faster than simulation programs run on digital computers. Serial shift register routes clock pulses C1 to neurons in sequence. Clock pulses C2 interrogate neurons. Neuron interconnection information stored in simulated synapses. Can be expanded to greater complexity.

B88-10011

PROGRAMMABLE SYNAPTIC ARRAYS FOR ELECTRONIC NEURAL NETWORKS

ANILKUMAR P. THAKOOR (Caltech), and JOHN LAMBE (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16674 Vol. 12, No. 1, P. 35

High resistances prevent hotspots in parallel input and output operation. Nonvolatile computer memory combines ultrahigh storage density with extremely-low power dissipation. Accommodates about 1 billion bits in square centimeter of surface area. Bit written with expenditure of less than 1 nanojoule of energy

and read with even lower energy. Developed for parallel input and output operation.

B88-10012

BLANKET GATE WOULD ADDRESS BLOCKS OF MEMORY

JOHN LAMBE (Caltech), ALEXANDER MOOPENN (Caltech), and ANILKUMAR P. THAKOOR (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16682

Vol. 12, No. 1, P. 36

Circuit-chip area used more efficiently. Proposed gate structure selectively allows and restricts access to blocks of memory in electronic neural-type network. By breaking memory into independent blocks, gate greatly simplifies problem of reading from and writing to memory. Since blocks not used simultaneously, share operational amplifiers that prompt and read information stored in memory cells. Fewer operational amplifiers needed, and chip area occupied reduced correspondingly. Cost per bit drops as result.

B88-10013

INTEGRATED CIRCUIT FOR SIMULATION OF NEURAL NETWORK

ANILKUMAR P. THAKOOR (Caltech), ALEXANDER W. MOOPENN (Caltech), and SATISH K. KHANNA (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17059

Vol. 12, No. 1, P. 38

Ballast resistors deposited on top of circuit structure. Cascadable, programmable binary connection matrix fabricated in VLSI form as basic building block for assembly of like units into content-addressable electronic memory matrices operating somewhat like networks of neurons. Connections formed during storage of data, and data recalled from memory by prompting matrix with approximate or partly erroneous signals. Redundancy in pattern of connections causes matrix to respond with correct stored data.

B88-10014

THREE-WAVEGUIDE BEAM AND POLARIZATION SPLITTER

GAIL A. BOGERT (AT&T Technologies, Inc.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16986

Vol. 12, No. 1, P. 40

Different modes guided to different output ports. Monolithic ensemble of three waveguides splits input signal beam into three output beams according to polarization components. Waveguides made of titanium diffused in lithium niobate. Before diffusion step, titanium deposited to form inner waveguide and outer waveguides on both sides of inner one.

B88-10037

COMPUTING RADIATION CHARACTERISTICS OF PHASED ARRAYS

ROBERTO J. ACOSTA

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14460

Vol. 12, No. 1, P. 68

Radiated powers, directivities, and radiation patterns calculated. Computer program devised to generalize results and obtain efficient numerical technique for computing directivity and radiation pattern of generalized array. Characteristics of generalized array used in program include arbitrary element locations; and polarizations and excitations of elements. Written in FORTRAN IV.

B88-10072

COMPOSITE CATHODE-RAY TUBE

MUKUND D. GANGAL (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16549

Vol. 12, No. 2, P. 14

Proposed composite cathode-ray tube consists of rectangular array of cathode-ray tubes joined at edges, sharing common vacuum. Each electron gun generates independent image on portion of screen. Composite tube operates most advantageously under digital control to make available several display modes. Brightness and resolution of large images increased. Useful for classroom presentations, conferences, and the like.

B88-10073

ADDRESSABLE INVERTER MATRIX TESTS INTEGRATED-CIRCUIT WAFER

MARTIN G. BUEHLER (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16612

Vol. 12, No. 2, P. 14

Addressing elements indirectly through shift register reduces number of test probes. With aid of new technique, complex test structure on silicon wafer tested with relatively small number of test probes. Conserves silicon area by reduction of area devoted to pads. Allows thorough evaluation of test structure characteristics and of manufacturing process parameters. Test structure consists of shift register and matrix of inverter/transmission-gate cells connected to two-by-ten array of probe pads. Entire pattern contained in square area having only 1.6-millimeter sides. Shift register is conventional static CMOS device using inverters and transmission gates in master/slave D flip-flop configuration.

B88-10074

DETECTING FAULTS IN HIGH-VOLTAGE TRANSFORMERS

RAYMOND K. BLOW (Rockwell International Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29225

Vol. 12, No. 2, P. 18

Simple fixture quickly shows whether high-voltage transformer has excessive voids in dielectric materials and whether high-voltage lead wires too close to transformer case. Fixture is 'go/no-go' indicator; corona appears if transformer contains such faults. Nests in wire mesh supported by cap of clear epoxy. If transformer has defects, blue glow of corona appears in mesh and is seen through cap.

B88-10075

ELECTRICALLY-CONDUCTIVE POLYARAMID CABLE AND FABRIC

RALPH F. ORBAN (Material Concepts, Inc.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26031

Vol. 12, No. 2, P. 18

Tows coated with metal provide strength and conductance. Cable suitable for use underwater made of electrically conductive tows of metal-coated polyaramid filaments surrounded by electrically insulating jacket. Conductive tows used to make conductive fabrics. Tension borne by metal-coated filaments, so upon release, entire cable springs back to nearly original length without damage.

B88-10076

SUBMOUNTS FOR LASER-DIODE CHIPS

ANIL RAMNIKLAL DHOLAKIA (RCA Corp.), and LOUIS TRAGER

01 ELECTRONIC COMPONENTS AND CIRCUITS

(RCA Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13651 Vol. 12, No. 2, P. 21

Universal method of bonding laser-diode chip to mount developed. New technique applicable to almost all different types of mounts used in production of laser diodes. Submounts etched, then cut from metal foil. Advantage of this type of submount is edge on which diode mounted is very sharp, eliminating costly need for sharp edge on mount itself.

B88-10077

IMPROVED TRAVELING-WAVE TUBE

ART ROUSSEAU (Hughes Aircraft Co.), IVO TAMMARU (Hughes Aircraft Co.), and JOHN VASZARI (Hughes Aircraft Co.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14580 Vol. 12, No. 2, P. 22

New space traveling-wave tube (TWT) provides coherent source of 75 watts of continuous-wave power output over bandwidth of 5 GHz at frequency of 65 GHz. Coupled-cavity TWT provides 50 dB of saturated gain. Includes thermionic emitter, M-type dispenser cathode providing high-power electron beam. Beam focused by permanent magnets through center of radio-frequency cavity structure. Designed for reliable operation for 10 years, and overall efficiency of 35 percent minimizes prime power input and dissipation of heat.

B88-10078

PERFORMANCE OF INFRARED-DETECTOR ARRAY

J. H. GOEBEL, M. E. MCKELVEY, C. R. MCCREIGHT, and G. M. ANDERSON

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11735 Vol. 12, No. 2, P. 22

Report describes design, characteristics, and performance of Si:Sb integrated array of infrared detectors, sensitivity of which extends to wavelength of about 31 micrometer, improvement over 28-micrometer limit of current Si:As impurity-band-conduction devices. Also describes electronics and special Dewar system developed to test device at low temperature to reduce background noise.

B88-10155

PULSE COIL TESTER

RICHARD A. SIMON (Rockwell International Corp.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29301 Vol. 12, No. 3, P. 18

Set of relays tested easily and repeatedly. Pulse coil tester causes coil under test to generate transient voltage; waveform indicates condition of coil. Tester accommodates assembly of up to four coils at a time.

B88-10156

MOSFET ELECTRIC-CHARGE SENSOR

PAUL A. ROBINSON, JR. (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16045 Vol. 12, No. 3, P. 18

Charged-particle probe compact and consumes little power. Proposed modification enables metal oxide/semiconductor field-effect transistor (MOSFET) to act as detector of static electric charges or energetic charged particles. Thickened gate insulation acts as control structure. During measurements metal gate allowed

to 'float' to potential of charge accumulated in insulation. Stack of modified MOSFET'S constitutes detector of energetic charged particles. Each gate 'floats' to potential induced by charged-particle beam penetrating its layer.

B88-10157

OPTICAL ISOLATOR FOR USE WITH SINGLE-MODE FIBER

GEORGE F. LUTES (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17207 Vol. 12, No. 3, P. 20

Assembly of commercially available components acts as single-mode fiber-optic isolator with lower forward-transmission loss and higher attenuation of reverse transmission than previously achieved in single unit. New design reduces cost and improves performance of optical gyroscopes, precise time- and frequency-signal-distribution systems, and other systems that include fiber optics and isolators.

B88-10158

'THUMBALL' AUXILIARY DATA-INPUT DEVICE

H. DOUGLAS GARNER, ANTHONY M. BUSQUETS, THOMAS W. HOGGE, and RUSSELL V. PARRISH

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13626 Vol. 12, No. 3, P. 22

Track-ball-type device mounted on joystick and operated by thumb. Thumball designed to enable precise input of data about two different axes to autopilot, avionics computer, or other electronic device without need for operator to remove hands from joystick or other vehicle control levers.

B88-10159

DEVIATIONS OF MICROWAVE ANTENNAS FROM HOMOLOGY

KRISTYNA KIEDRON (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17008 Vol. 12, No. 3, P. 22

Surface distortions quantified over range of tilt angles. Formula advanced to quantify deviation of paraboloidal antenna reflector from intended homologous shape, over range of tilt ranges.

B88-10209

DIODE-LASER ARRAY SUPPRESSES EXTRANEEOUS MODES

ELYAHOU KAPON (Caltech), CHRIS P. LINDSEY (Caltech), JOSEPH KATZ (Caltech), SHLOMO MARGALIT (Caltech), and AMNON YARIV (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16465 Vol. 12, No. 4, P. 14

Diode parameters varied to shape output beam. Array of phase-locked GaAs/GaAlAs diode lasers produces light beam with one main radiation lobe. Physical parameters of laser diodes differ from each other in way that favors oscillation in fundamental supermode, suppressing oscillation in higher-order modes.

B88-10210

MULTIPLE-FEED DESIGN FOR DSN/SETI ANTENNA

S. D. SLOBIN (Caltech), and D. A. BATHKER (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16883 Vol. 12, No. 4, P. 15

Frequency bands changed with little interruption of operation. Modification of feedhorn mounting on existing 34-m-diameter antenna in Deep Space Network (DSN) enables antenna to be shared by Search for Extra-Terrestrial Intelligence (SET) program with minimal interruption of DSN spacecraft tracking. Modified antenna useful in terrestrial communication systems requiring frequent changes of operating frequencies.

B88-10211

ELECTRICALLY-ISOLATING ANALOG AMPLIFIER

JOHN PAULKOVICH, and G. ERNEST RODRIGUEZ

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13150

Vol. 12, No. 4, P. 16

Signals transmitted between units at different ground potentials. Analog amplifier electrically isolates input from output through use of optoelectronic components. Analog isolation amplifier uses dual-transistor optoisolator, preventing transmission of common-mode voltage from input to output. Circuit useful in spacecraft electronic systems.

B88-10212

SMALL, OPTICALLY-DRIVEN POWER SOURCE

RICHARD H. COCKRUM (Caltech), and KE-LI J. WANG (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16827

Vol. 12, No. 4, P. 19

Power transmitted along fiber-optic cables. Transmitted as infrared light along fiber-optic cable, converted to electricity to supply small electronic circuit. Power source and circuit remains electrically isolated from each other for safety or reduces electromagnetic interference. Array of diodes made by standard integrated-circuit techniques and packaged for mounting at end of fiber-optic cable.

B88-10213

CHECKING PLUMBING CONNECTIONS ELECTRICALLY

JERRY L. CHAPPEL (Rockwell International Corp.)

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29289

Vol. 12, No. 4, P. 20

Ports identified by Zener-diode voltages. Electronic verification circuits assist in assembly of multiple-line plumbing by helping to ensure proper lines joined to proper input and output ports. Zener diode and electronic jack added to each fixture. Zener breakdown voltage is different for each port. When fixture makes fluid connection, also makes electrical connection. Zener breakdown voltage identifies line, port, or valve to which fluid line connected.

B88-10214

REFINED TRANSISTOR MODEL FOR SIMULATION OF SEU

JOHN A. ZOUTENDYK (Caltech), and REUBEN BENUMOF (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16771

Vol. 12, No. 4, P. 20

Equivalent base resistance added. Theoretical study develops equations for parameters of Gummel-Poon model of bipolar junction transistor: includes saturation current, amplification factors, charging times, knee currents, capacitances, and resistances. Portion of study concerned with base region goes beyond Gummel-Poon analysis to provide more complete understanding of transistor behavior. Extended theory useful in simulation of single-event upset (SEU) caused in logic circuits by cosmic rays or other ionizing radiation.

B88-10244

MOLECULAR-BEAM-EPITAXY PROGRAM

PATRICIA D. SPARKS (University of California, Los Angeles)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16706

Vol. 12, No. 4, P. 48

Molecular Beam Epitaxy (MBE) computer program developed to aid in design of single- and double-junction cascade cells made of silicon. Cascade cell has efficiency 1 or 2 percent higher than single cell, with twice the open-circuit voltage. Input parameters include doping density, diffusion lengths, thicknesses of regions, solar spectrum, absorption coefficients of silicon (data included for 101 wavelengths), and surface recombination velocities. Results include maximum power, short-circuit current, and open-circuit voltage. Program written in FORTRAN IV.

B88-10262

SINGLE-LAYER, MULTICOLOR ELECTROLUMINESCENT PHOSPHORS

JAMES B. ROBERTSON

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13616

Vol. 12, No. 5, P. 18

Etching eliminated in producing phosphor layers for displays. New process enables production of single-layer, two-color phosphor layer without etching. Method of construction, beginning with glass substrate with electrode and insulator layers, involves deposition of green phosphor masking with metal mask or photoresist; diffusion or ion implantation of manganese through mask to produce red phosphor and removal of mask.

B88-10263

MASER OSCILLATOR WITH DIELECTRIC RESONATORS

G. JOHN DICK (Caltech), and DONALD M. STRAYER (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17157

Vol. 12, No. 5, P. 19

Two-resonator design yields low phase noise. Oscillator exhibits phase noise intermediate between phase noises of unstabilized microwave oscillators and stabilized ruby-maser oscillators with superconducting cavities. Contains two total-internal-reflection dielectric resonators in normally-conductive copper cavity. Two-resonator maser design provides phase stability, isolation between pump and output channels, and variable maser coupling.

B88-10264

BURST-LOCKED OSCILLATOR AVOIDS SIDE LOCK

ROBERT A. DISCHERT (RCA Corp.)

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21257

Vol. 12, No. 5, P. 20

Counting circuit corrects errors when side lock occurs. Digital error-detection-and-correction circuit in color-television oscillator circuit provides synchronization when color-burst frequency drifts outside normal tolerance. Digital side-lock-prevention circuit used in television color-burst phase-lock-loop oscillator provides greater tolerance of off-frequency signals than crystal-controlled oscillators.

B88-10265

EQUATIONS FOR ROTARY TRANSFORMERS

PHIL M. SALOMON (Caltech), PETER J. WIKTOR (Caltech), and CARL A. MARCHETTO (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

01 ELECTRONIC COMPONENTS AND CIRCUITS

NPO-17120

Vol. 12, No. 5, P. 21

Equations derived for input impedance, input power, and ratio of secondary current to primary current of rotary transformer. Used for quick analysis of transformer designs. Circuit model commonly used in textbooks on theory of ac circuits.

B88-10266

IMPROVED CHARGE-COUPLED IMAGER FOR X RAYS

MARK WADSWORTH (Texas Instruments, Inc.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17312

Vol. 12, No. 5, P. 21

Device proposed to improve imaging of x rays. Features thin layer of oxide in virtual phase to increase quantum efficiency and depletion layer nearly as thick as epitaxial silicon layer to increase resolution. Applications include imaging spectrometers for x-ray astronomy, investigations of plasmas, and x-ray crystallography.

B88-10267

MICROWAVE TRANSMITTER WITH MULTIMODE OUTPUT SECTION

DANIEL J. HOPPE (Caltech), ALAUDIN M. BHANJI (Caltech), and REGINALD A. CORMIER (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16826

Vol. 12, No. 5, P. 22

Output-waveguide structure transports 400 kW of continuous-wave signal power at 34.5 GHz. Transmitter generates 400 kW of continuous-wave (CW) signal power. Main feature of conceptual design of this microwave transmitter is output section. Output waveguide structure includes mode converter, directional coupler, polarization monitor, and corrugated overmoded output section. Output directional pattern suitable for antenna illumination without flared feedhorn.

B88-10268

EFFECTS OF RADIATION ON ELECTRONICS-ADDITIONAL REFERENCES

FRANK L. BOUQUET (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16958

Vol. 12, No. 5, P. 23

Bibliography abstracts summarizing literature on effects of radiation on new electronic devices. This and second volume cover years 1984 and 1985. Third volume, covers 1982 and 1983 (previously published).

B88-10269

INTEGRATED ARRAYS OF INFRARED DETECTORS

J. H. GOEBEL, and C. R. MCCREIGHT

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18475)

ARC-11787

Vol. 12, No. 5, P. 25

Report presents overview of technology of integrated arrays of infrared detectors. Covers arrays now available and those under development. Gives examples of astronomical images illustrating potential of infrared arrays for scientific investigations.

B88-10320

SYNCHRONOUS PHOTODIODE-SIGNAL SAMPLER

HOWARD K. PRIMUS (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16698

Vol. 12, No. 6, P. 36

Synchronous sampling circuit increases signal-to-noise ratio of measurements of chopped signal of known phase and frequency in presence of low-frequency or dc background noise. Used with linear array of photoelectric sensors for locating edge of metal plate. Multiplexing circuit cycles through 16 light-emitting-diode/photodiode pairs, under computer control. Synchronized with multiplexer so edge detector makes one background-subtracted signal measurement per emitter/detector pair in turn.

B88-10321

DUAL-CATHODE ELECTRON-BEAM SOURCE

JAMES G. BRADLEY (Caltech), JOSEPH M. CONLEY (Caltech), and DAVID B. WITTRY (University of Southern California)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16878

Vol. 12, No. 6, P. 37

Beam from either cathode electromagnetically aligned with exit port. Electron beam from either of two cathodes deflected by magnetic and electric fields to central axis. Mechanical alignment of beam easy because cathode axes, anode apertures, and electron trajectories coplanar. Applications where uninterrupted service needed: scanning electron microscopes, transmission electron microscopes, electron-beam lithography equipment, Auger instruments, and microfocused x-ray sources.

B88-10322

DIFFRACTION-COUPLED, PHASE-LOCKED SEMICONDUCTOR LASER ARRAY

JOSEPH KATZ (Caltech), AMNON YARIV (Caltech), and SHLOMO MARGALIT (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16198

Vol. 12, No. 6, P. 38

Stable, narrow far field produced. Array of lasers fabricated on single chip. Individual laser waveguides isolated from each other except in end portions, where diffraction coupling takes place. Radiation pattern far from laser array has single, sharp central lobe when all lasers operate in phase with each other. Shape of lobe does not vary appreciably with array current. Applications include recording, printing, and range finding.

B88-10323

PHASE-LOCKED SEMICONDUCTOR LASERS WITH SEPARATE CONTACTS

JOSEPH KATZ (Caltech), AMNON YARIV (Caltech), and SHLOMO MARGALIT (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16254

Vol. 12, No. 6, P. 40

Individual current feeds enable better uniformity and flexible control. Separate contacts for lasers in array enable control of output radiation pattern and compensation of manufacturing nonuniformities among lasers. Concept of separate current control described for two-laser array in 'Semiconductor Laser Phased Array' (NPO-15963).

B88-10324

MATCHING NETWORK FOR MICROWAVE PREAMPLIFIER

JACK D. SIFRI (Hughes Aircraft Co.)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16851

Vol. 12, No. 6, P. 40

Stable operation and broadband, optimum noise performance achieved. Amplifier designed by new method of matching input impedance for optimum noise figure and stability. Output more nearly constant over wider frequency range.

B88-10325**SEARCHING CIRCUIT FOR A SERVOLOOP**

E. H. SIGMAN (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17003

Vol. 12, No. 6, P. 42

Feedback error voltage forced into range of stability. Circuit connected in series with error-voltage line of feedback loop. When loop operates normally in stable region, searching circuit does not disturb operation, and error-voltage output of loop filter is control voltage. When servo unlocks and error-voltage output of loop filter wanders into unstable range, searching circuit forces control voltage to sweep through stable region repeatedly until lock recovered. Consists of two halves identical except polarities of some parts in each half opposite of corresponding parts in other half.

B88-10326**VIDEO ANALOG SIGNAL DIVIDER**

GREGORY M. BUCK

Jun. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13740

Vol. 12, No. 6, P. 44

Video analog signal divider produces black-and-white composite video signal based on color ratio. Device inexpensive, uses signal from standard red/green/blue camera as input. Used to produce quantitative thermal images of two-color phosphor coatings.

B88-10327**TIME-ZONE-PATTERN SATELLITE BROADCASTING ANTENNA**

VICTOR GALINDO (Caltech), YAHYA RAHMAT-SAMII (Caltech), and WILLIAM A. IMBRIALE (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16522

Vol. 12, No. 6, P. 46

Direct-broadcast satellite antenna designs provide contoured beams to match four time zones in 48 contiguous states and spot beams for Alaska, Hawaii, and Puerto Rico presented in 29-page report. Includes descriptions of procedures used to arrive at optimized designs. Arrangements, amplitudes, and phases of antenna feeds presented in tables. Gain contours shown graphically. Additional tables of performance data given for cities in service area of Eastern satellite.

B88-10328**TESTS OF AMORPHOUS-SILICON PHOTOVOLTAIC MODULES**

RONALD G. ROSS, JR. (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17303

Vol. 12, No. 6, P. 46

Progress in identification of strengths and weaknesses of amorphous-silicon technology detailed. Report describes achievements in testing reliability of solar-power modules made of amorphous-silicon photovoltaic cells. Based on investigation of modules made by U.S. manufacturers. Modules subjected to field tests, to accelerated-aging tests in laboratory, and to standard sequence of qualification tests developed for modules of crystalline-silicon cells.

B88-10329**CORROSION IN AMORPHOUS-SILICON SOLAR CELLS AND MODULES**

GORDON R. MON (Caltech), LIANG-CHI WEN (Caltech), and RONALD G. ROSS, JR. (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17302

Vol. 12, No. 6, P. 47

Paper reports on corrosion in amorphous-silicon solar cells and modules. Based on field and laboratory tests, discusses causes of corrosion, ways of mitigating effects, and consequences for modules already in field. Suggests sealing of edges as way of reducing entry of moisture. Cell-free perimeters or sacrificial electrodes suggested to mitigate effects of sorbed moisture. Development of truly watertight module proves to be more cost-effective than attempting to mitigate effects of moisture.

B88-10346**DISTRIBUTED ARCHITECTURE FOR PHASED-ARRAY ANTENNAS**

SHAYLA E. DAVIDSON, BRIAN BOURGEOIS, R. P. JEDLICKA (New Mexico State University), and P. A. HENRY (New Mexico State University)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21236

Vol. 12, No. 6, P. 71

Distributed Architecture for Phased Array Antennas (DISTAR) computer program simulation tool used to study implementation of distributed phased-array equipment. Allows placement of possibly-faulty transmitting/receiving modules at locations throughout array. Variations in amplifiers and phase shifters degrades performance of antenna, depending on environmental conditions and array architecture. Enables antenna designer to examine characteristics of array and how they affect both types and extents of antenna failures. General specifications for amplifier and phase-shifter tolerances determined for various architectures. Written in FORTRAN 77.

B88-10358**SCHOTTKY DIODE WITH SURFACE CHANNEL**

WILLIAM BISHOP (University of Virginia), ROBERT J. MATTAUCH (University of Virginia), KATHLEEN MCKINNEY (University of Virginia), and DIANE GARFIELD (University of Virginia)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13063

Vol. 12, No. 7, P. 22

Straightforward design changes improve performance and simplify fabrication. Anode contact finger forms bridge over channel material removed to reduce parasitic shunt capacitance. Device made by standard processing techniques readily accommodating changes of design.

B88-10359**RF TESTING OF MICROWAVE INTEGRATED CIRCUITS**

R. R. ROMANOFSKY, G. E. PONCHAK, K. A. SHALKHAUSER, and K. B. BHASIN

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-22065)

LEW-14639

Vol. 12, No. 7, P. 23

Fixtures and techniques are undergoing development. Four test fixtures and two advanced techniques developed in continuing efforts to improve RF characterization of MMIC's. Finline/waveguide test fixture developed to test submodules of 30-GHz monolithic receiver. Universal commercially-manufactured coaxial test fixture modified to enable characterization of various microwave solid-state devices in frequency range of 26.5 to 40 GHz. Probe/waveguide fixture is compact, simple, and designed

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for non destructive testing of large number of MMIC's. Nondestructive-testing fixture includes cosine-tapered ridge, to match impedance waveguide to microstrip. Advanced technique is microwave-wafer probing. Second advanced technique is electro-optical sampling.

B88-10360

IMAGE-METHOD GAIN MEASUREMENT WITH MISMATCH

RICHARD Q. LEE, and MAURICE F. BADDOUR

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16968)

LEW-14555

Vol. 12, No. 7, P. 24

New formula accounts for multiple reflections. In image method antenna placed facing its image in reflecting plane. Power transmitted by antenna and portion of transmitted power received by antenna after reflection from plane measured at various distances R.

B88-10361

HOT-FILM ANEMOMETER FOR BOUNDARY-FLOW TRANSITIONS

HARRY R. CHILES, and J. BLAIR JOHNSON

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N85-33121)

ARC-11811

Vol. 12, No. 7, P. 26

Temperature-compensated instrument yields data at subsonic and supersonic speeds. Modifications in new anemometer include addition of temperature-compensation resistor and resistors R_s and R_p series and parallel with compensation device.

B88-10362

FORMULA GIVES BETTER CONTACT-RESISTANCE VALUES

UDO LIENEWEG (Caltech), and DAVID J. HANNAMAN (Caltech)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17096

Vol. 12, No. 7, P. 28

Lateral currents in contact strips taken into account. Four-terminal test structures added to integrated circuits to enable measurement of interfacial resistivities of contacts between thin conducting layers. Thin-film model simplified quasi-two-dimensional potential model that accounts adequately for complicated three-dimensional, nonuniform current densities. Effects of nonuniformity caused by lateral current flow in strips summarized in equivalent resistance R_s and voltage V_s.

B88-10363

FLEXIBLE CERAMIC-INSULATED CABLE

FRANK L. BOUQUET (Caltech)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16917

Vol. 12, No. 7, P. 30

Cable withstands heat, radiation, and oxidation. Ceramic beads electrically insulate copper conductor from sheath of copper tape. Also suitable for furnaces, nuclear reactors, and robots operating in hot, radioactive environments.

B88-10364

ACOUSTICAL CONVECTIVE COOLING OR HEATING

EUGENE H. TRINH (Caltech), and JUDITH L. ROBEY (Caltech)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17278

Vol. 12, No. 7, P. 31

Small, efficient ultrasonic device circulates fluid. Vibrating at ultrasonic frequency, piezoelectric driver sets up vortexes

transferring heat to or from object in space. Used on Earth to apply localized or concentrated cooling to individual electronic components or other small parts.

B88-10397

SWITCHING VOLTAGE REGULATOR

W. T. MCLYMAN (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16889

Vol. 12, No. 8, P. 20

Both pulsed and continuous outputs available. Switching power-supply circuit converts input power from two 9-V batteries in series to output of 5 Vdc regulated within 1.5 percent, either at continuous current of 5 mA or at current of 500 mA in 0.5-s pulses at 1-min intervals. Power supply is buck converter. Principle of operation inductive and capacitive filtering of controlled pulses of battery voltage.

B88-10398

CONTACTLESS COUPLING FOR POWER AND DATA

JOHN C. MOODY (OAO Corp.), and JOSEPH W. FOLEY (OAO Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13059

Vol. 12, No. 8, P. 22

Experimental flat-plate coupling transmits digital data signals and electrical power across small gap between two modules. Split transformer and optoelectronic components transmit electrical power and digital signals across small gap. Coupling concept useful substitute for electrical connectors in equipment assembled by robots, remote manipulators, or humans working in protective clothing or otherwise restricted in dexterity. Offers higher reliability due to one overall alignment mechanism as opposed to multiple pin/socket alignment requirements.

B88-10399

MULTIPLE-COIL, PULSE-INDUCTION METAL DETECTOR

EDWARD S. LESKY, ALAN M. REID, WILTON E. BUSHONG, and DUANE P. DICKEY

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

KSC-11386

Vol. 12, No. 8, P. 24

Multiple-head, pulse-induction metal detector scans area of 72 feet squared with combination of eight detector heads, each 3 ft. square. Head includes large primary coil inducing current in smaller secondary coils. Array of eight heads enables searcher to cover large area quickly. Pulses applied to primary coil, induced in secondary coils measured to determine whether metal present within range of detector head. Detector designed for recovery of Space Shuttle debris.

B88-10400

INTEGRATED INVERTER AND BATTERY CHARGER

WALLY E. RIPPEL (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17133

Vol. 12, No. 8, P. 26

Circuit combines functions of dc-to-ac inversion (for driving ac motor in battery-powered vehicle) and ac-to-dc conversion (for charging battery from ac line when vehicle not in use). Automatically adapts to either mode. Design of integrated inverter/charger eliminates need for duplicate components, saves space, reduces weight and cost of vehicle. Advantages in other applications: load-leveling systems, standby ac power systems, and uninterruptible power supplies.

B88-10401**SOLID-STATE SINGLE-PHOTON COUNTER**

D. L. ROBINSON (Caltech), and B. D. METSCHER (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17103**Vol. 12, No. 8, P. 27**

Avalanche photodiode used to detect single photons if cooled to optimum temperature and overbiased beyond breakdown voltage. Offers two to three times sensitivity of photomultiplier tubes commonly used for photon detection. When cooled to reduce number of thermal carriers, avalanche photodiode reverse-biased beyond normal breakdown voltage to give it extremely-high internal gain of 10 to seventh power to 10 to eighth power. Advantages of solid-state devices to applications requiring low-level light detection, optical communication, astronomy, remote sensing, optical metrology, and optical signal processing.

B88-10402**BIPOLAR-BATTERY CONSTRUCTION**

WALLY E. RIPPEL (Caltech), and DEAN B. EDWARDS (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15315**Vol. 12, No. 8, P. 30**

Bipolar batteries fabricated in continuous quasi-automated process. Components of battery configured so processing steps run sequentially. Key components of battery, bipolar plate and bipolar separator, fabricated separately and later joined together.

B88-10458**REDUNDANT GROUNDING CIRCUIT FOR ARC WELDING**

RICHARD K. BURLEY (Rockwell International Corp.)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29396**Vol. 12, No. 9, P. 28**

Arc burns at loose ground connections prevented. Protective grounding scheme for arc-welding power supply includes four ground leads to workpiece and circuit that automatically turns off welding current if one or two ground leads becomes disconnected. Prevents burns and inadvertent welding occurring where full welding current passes through single loose ground contact.

B88-10459**PROGRAMMABLE PULSER**

ERIC BAUMANN, and ANTHONY MEROLLA (Sverdrup Technology, Inc.)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14585**Vol. 12, No. 9, P. 32**

User controls number of clock pulses to prevent burnout. New digital programmable pulser circuit in three formats: freely running, counted, and single pulse. Operates at frequencies up to 5 MHz, with no special consideration given to layout of components or to terminations. Pulser based on sequential circuit with four states and binary counter with appropriate decoding logic. Number of programmable pulses increased beyond 127 by addition of another counter and decoding logic. For very large pulse counts and/or very high frequencies, use synchronous counters to avoid errors caused by propagation delays. Invaluable tool for initial verification or diagnosis of digital or digitally controlled circuitry.

B88-10460**PHOTOGRAMMETRY OF A PARABOLIC ANTENNA**

W. D. MERRICK (Caltech), F. L. LANSING (Caltech), F. W. STOLLER (Caltech), and V. B. LOBB (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17088**Vol. 12, No. 9, P. 35**

Surface measured with accuracy better than 10 to the negative fifth power times diameter. Report describes use of advanced close-range photogrammetry to determine deviations of 34-m-diameter antenna main reflector and subreflector from nominal paraboloidal shapes. Measurements enable removal of linear offsets and angular misalignments of subreflector, with consequent increase of 4 percent in aperture efficiency.

B88-10508**PROTECTIVE SOCKET FOR INTEGRATED CIRCUITS**

CHRIS WILKINSON, and GREG HENEGAR

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13033**Vol. 12, No. 10, P. 20**

Socket for integrated circuits (IC's) protects from excessive voltages and currents or from application of voltages and currents in wrong sequence during insertion or removal. Contains built-in switch that opens as IC removed, disconnecting leads from signals and power. Also protects other components on circuit board from transients produced by insertion and removal of IC. Makes unnecessary to turn off power to entire circuit board so other circuits on board continue to function.

B88-10509**ESTIMATING RATES OF SINGLE-EVENT UPSETS**

JOHN A. ZOUTENDYK (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17270**Vol. 12, No. 10, P. 24**

Mathematical model yields estimates of upper and lower bounds on rates of single-event upsets (SEU's) in logic circuits. SEU's are reversible changes in logic states, caused by single high-energy ions. Energetic ions passed through device along tracks perpendicular to surface, to determine parameters of model. Used to estimate rates caused by ions of various energies incident at arbitrary angles. Useful in design of integrated circuits as high-density memories for minimal susceptibility to bit errors.

B88-10510**LENS ANTENNA FOR MOBILE/SATELLITE COMMUNICATION**

D. G. BODNAR (Georgia Tech Research Institute), and B. K. RAINER (Georgia Tech Research Institute)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16948**Vol. 12, No. 10, P. 24**

Flat, compact antenna made of stripline elements aimed at fixed elevation angle but steered electronically in azimuth. Design simplified by maintaining fixed elevation and relying on width of beam to cover desired elevation range. Need for phase shifter at each radiating element eliminated by arranging elements in circles and feeding through stripline disks called 'R-KR lenses'. Used in Mobile/Satellite Service, antenna mounted on top of vehicle on Earth and used to keep transmitted and received antenna beams aimed approximately toward communication satellite.

B88-10511**MEASURING CRITICAL CHARGES FOR SINGLE-EVENT UPSETS**

MARTIN G. BUEHLER (Caltech), and BRENT R. BLAES (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

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MD. 21240-0757

NPO-17073

Vol. 12, No. 10, P. 28

Concept for determining susceptibility of integrated circuits to single-event upsets (SEU's) based on direct measurement of critical charge causing upset. Test circuit is modified version of standard complementary metal-oxide/semiconductor static cell. Contains six transistors, connected to form latch that retains state of cell set by input pulses. Makes possible to evaluate vulnerability to SEU during design and development of digital equipment.

B88-10512

HANDRAIL LIGHTING MODULE

JOHN P. MATTEI (Rockwell International Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21302

Vol. 12, No. 10, P. 30

Lightweight, space-saving combined handrail-and-fluorescent-light unit serves decorative or safety functions. Fluorescent lamp mounted inside clear tubular plastic housing shaped to form handrail. Designed for either temporary or permanent installation or part of emergency lighting system.

B88-10513

HAZARD-FREE PYROTECHNIC SIMULATOR

WILLIAM B. MCALISTER, JR.

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13111

Vol. 12, No. 10, P. 30

Simulator evaluates performance of firing circuits for electroexplosive devices (EED's) safely and inexpensively. Tests circuits realistically when pyrotechnic squibs not connected and eliminates risks of explosions. Used to test such devices as batteries where test conditions might otherwise degrade them.

B88-10514

TUNABLE MICROWAVE CAVITY FOR ION SOURCE

SHIGEO NAKANISHI, FRANK S. CALCO, and AUGUST R. SCARPELLI

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-13935

Vol. 12, No. 10, P. 32

Movable probe and tuning wall adjusted to obtain resonance at microwave frequency used to generate plasma in cell at one end of microwave cavity. Electroless discharge without disadvantages of dc-cathode-discharge and RF-induction methods. To achieve precise positioning, coaxial probe extends into microwave cavity through tube.

B88-10515

CIRCULAR-WAVEGUIDE POWER COMBINER/DIVIDER

VERNON DUNN (Ford Aerospace and Communications Corp.)

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-12996

Vol. 12, No. 10, P. 34

Power combiner/divider devised in which output from several solid-state modules combined directly into TE₀₁ mode of circular waveguide. Results in low-loss, wide band device: because axisymmetry of TE₀₁ mode, no essential limit on N. Latter feature is advantage in design of wide band, high-power, solid-state amplifiers operating at millimeter wavelengths.

B88-10556

STACKED METAL SILICIDE/SILICON FAR-INFRARED DETECTORS

JOSEPH MASERJIAN (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17194

Vol. 12, No. 11, P. 22

Selective doping of silicon in proposed metal silicide/silicon Schottky-barrier infrared photodetector increases maximum detectable wavelength. Stacking layers to form multiple Schottky barriers increases quantum efficiency of detector. Detectors of new type enhance capabilities of far-infrared imaging arrays. Grows by molecular-beam epitaxy on silicon wafers containing very-large-scale integrated circuits. Imaging arrays of detectors made in monolithic units with image-preprocessing circuitry.

B88-10557

SELECTING WIRE SIZES FOR SWITCHING POWER SUPPLIES

W. T. MCLYMAN (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17279

Vol. 12, No. 11, P. 24

Computer program eliminates trial and error. Determines size and number of strands of wire for low resistance at high frequency in switching power supplies.

B88-10558

FREQUENCY-ACCOMMODATING MANCHESTER DECODER

MARIO J. VASQUEZ (Rockwell International Corp.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21312

Vol. 12, No. 11, P. 24

No adjustment necessary to cover a 10:1 frequency range. Decoding circuit converts biphasic-level pulse-code modulation to nonreturn-to-zero (NRZ)-level pulse-code modulation plus clock signal. Circuit accommodates input data rate of 50 to 500 kb/s. Tracks gradual changes in rate automatically, eliminating need for extra circuits and manual switching to adjust to different rates.

B88-10559

NONUNIFORM SAMPLING OF RADIATION FROM ANTENNAS

Y. RAHMAT-SAMII (Caltech), and R. L. CHEUNG (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16961

Vol. 12, No. 11, P. 25

Far-field patterns reconstructed. Nonuniform-sampling technique uses interpolation algorithm to obtain far-field radiation pattern of antenna at any point u, v based on measurements at few sampling points. Applicable to any components of electric field 'E' at measurement locations in spherical coordinate system centered at antenna.

B88-10560

CONVERSION LOSSES IN GAAS SCHOTTKY-BARRIER DIODES

OLDWIG VON ROOS (Caltech), and KE-LI WANG (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16700

Vol. 12, No. 11, P. 26

Parasitic losses reduced with lightly doped epitaxial layers of proper thickness. Report presents calculations of conversion losses in Schottky-barrier diodes. Theoretical work directed toward reduction of parasitic losses through proper design of space-charge layers; possible, to reduce barrier capacitances and contributions to barrier resistances from undepleted epitaxial layers.

B88-10561**RESPONSE OF A MOSFET TO A COSMIC RAY**

REUBEN BENUMOF (College of Staten Island), and JOHN A. ZOUTENDYK (College of Staten Island)
 Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17146**Vol. 12, No. 11, P. 26**

Theoretical paper discusses response of enhancement-mode metal oxide/semiconductor field-effect transistor to cosmic-ray ion that passes perpendicularly through gate-oxide layers. Even if ion causes no permanent damage, temporary increase of electrical conductivity along track of ion large enough and long enough to cause change in logic state in logic circuit containing MOSFET.

B88-10562**DETECTOR ARRAYS FOR INFRARED ASTRONOMY**

C. R. MCCREIGHT, M. E. MCKELVEY, J. H. GOEBEL, G. M. ANDERSON, and J. H. LEE
 Dec. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-24378)

ARC-11789**Vol. 12, No. 11, P. 28**

Paper describes status of program for developing integrated infrared detectors for astronomy. Program covers variety of detectors, including extrinsic silicon, extrinsic germanium, and indium antimonide devices with hybrid silicon multiplexers. Paper notes for arrays to reach background noise limit in cryogenic telescope, continued reductions in readout noise and dark current needed.

B88-10563**EMPIRICAL MODELING OF SINGLE-EVENT UPSET**

JOHN A. ZOUTENDYK (Caltech), LAWRENCE S. SMITH (Caltech), GEORGE A. SOLI (Caltech), PETER THIEBERGER (Brookhaven National Laboratory), STEPHEN L. SMITH (Intel Corp.), and GREGORY E. ATWOOD (Intel Corp.)
 Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16920**Vol. 12, No. 11, P. 28**

Experimental study presents examples of empirical modeling of single-event upset in negatively-doped-source/drain metal-oxide-semiconductor static random-access memory cells. Data supports adoption of simplified worst-case model in which cross section of SEU by ion above threshold energy equals area of memory cell.

B88-10564**NEW MODE FOR SINGLE-EVENT UPSETS**

JOHN A. ZOUTENDYK (Caltech), LAWRENCE S. SMITH (Caltech), GEORGE A. SOLI (Caltech), and ROGER Y. LO (Intel Corp.)
 Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17266**Vol. 12, No. 11, P. 29**

Report presents theory and experimental data regarding newly discovered mode for single-event upsets, (SEU's) in complementary metal-oxide/semiconductor, static random-access memories, CMOS SRAM's. SEU cross sections larger than those expected from previously known modes given rise to speculation regarding additional mode, and subsequent cross-section measurements appear to confirm speculation.

B89-10001**LOW-POWER MAGNETIC CURRENT SENSOR**

W. T. MCLYMAN (Caltech)
 Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-16888**Vol. 13, No. 1, P. 19**

Direct current sensed via saturable-core reactor. Transducer senses direct current magnetically, providing isolation between input and output. Detecting-and-isolating element saturable reactor, where input current passes through one-turn control coil. Provides output of 0 to 3 Vdc for input current of 0 to 15 Adc and consumes power of 22 mW at 10 Adc input. Input sensed magnetically, output electrically isolated from input.

B89-10002**MICROWAVE COMB GENERATOR**

E. H. SIGMAN (Caltech)
 Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17004**Vol. 13, No. 1, P. 20**

Stable reference tones aid testing and calibration of microwave receivers. Signal generator puts out stable tones in frequency range of 2 to 10 GHz at all multiples of reference input frequency, at any frequency up to 1 MHz. Called 'comb generator' because spectral plot resembles comb. DC reverse-bias current switched on and off at 1 MHz to generate sharp pulses in step-recovery diode. Microwave components mounted on back of special connector containing built-in attenuator. Used in testing microwave and spread-spectrum wide-band receivers.

B89-10003**CAPACITIVE DISPLACEMENT SENSOR WITH FREQUENCY READOUT**

KLAUS FRITSCH (John Carroll University)
 Jan. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14792**Vol. 13, No. 1, P. 21**

Simple displacement-measuring circuit senses capacitance between two parallel conducting plates and produces output signal, with frequency proportional to distance between plates. Principle of circuit provides advantages over other methods because of frequency-encoded output and high linearity. Used to measure displacements.

B89-10004**OPTIMAL PLACEMENT OF MULTIPLE ANTENNAS**

KYLE W. SHELTON (Lockheed Engineering and Management Services Co.), Y. C. LOH (Lockheed Engineering and Management Services Co.), and K. TU (Lockheed Engineering and Management Services Co.)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21291**Vol. 13, No. 1, P. 21**

Computer program based on pair of algorithms selects approximately optimal locations of antennas and approximately optimal number of elements in each antenna of multiple-antenna communication system. Obscuration in field of view at given antenna location taken into account in choice of number of antenna elements mounted there. Directional coverages of combinations of up to four antenna elements computed in search for combination to cover clear portion of field of view. Developed to aid design of antenna system of conceptual space station. Applied to system aboard ship or aircraft, on building in city, or in any location where transmission and reception blocked in some directions from each potential antenna-mounting point.

B89-10005**POWER-SUPPLY-CONDITIONING CIRCUIT**

L. E. PRIMAS (Caltech), and R. C. LOVELAND (Caltech)
 Jan. 1989 Additional information available through: NASA STI

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Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17233

Vol. 13, No. 1, P. 22

Fluctuations of voltage suppressed in power supplies for precise radio-frequency circuits. Circuit suppresses both periodic and random deviations of dc supply voltage from desired steady level. Highly-stable feedback voltage regulator, conditioner intended in conjunction with conventional power-supply circuit to provide constant voltage to atomic frequency standard or other precise oscillator. Without conditioners, outputs of most commercial power supplies contain fluctuations causing unacceptably-large phase and amplitude modulation of precise oscillators.

B89-10006

HYBRID INFRARED IMAGER

GARY C. BAILEY (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17218

Vol. 13, No. 1, P. 23

Experimental device has low noise and high uniformity. Infrared imaging device combines array of InSb photodetectors with array of silicon field-effect-transistor switches. InSb chip forms roof over Si chip, each InSb detector cell engaging indium bump on corresponding Si switch cell below it. FET switches in 128-by-128 array turn on in sequence, read out charges on 128-by-128 array of photodetectors and multiplex them in serial output that represents pattern of light on array of photodetectors. Useful in sensitive infrared cameras for astronomy, medicine, inspection, and military surveillance. Reads out image data at rates up to 10 MHz and expands to 256-by-256 array.

B89-10007

BIN DIODE FOR SUBMILLIMETER WAVELENGTHS

J. MASERJIAN (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17258

Vol. 13, No. 1, P. 24

Diode formed by selective doping during epitaxial growth, starting with semi-insulating substrate. Use of high-mobility semiconductors like GaAs extends cutoff frequency. Either molecular-beam epitaxy (MBE) or organometallic chemical-vapor deposition used to form layers of diode. Planar growth process permits subsequent fabrication of arrays of diodes by standard photolithographic techniques, to achieve quasi-optical coupling of submillimeter radiation. Useful for generation of harmonics or heterodyne mixing in receivers for atmospheric and space spectroscopy operating at millimeter and submillimeter wavelengths. Used as frequency doublers or triplers, diodes of new type extend frequency range of present solid-state oscillators.

B89-10008

TESTING FIXTURE FOR MICROWAVE INTEGRATED CIRCUITS

ROBERT ROMANOFKY, and KURT SHALKHAUSER

Jan. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14746

Vol. 13, No. 1, P. 25

Testing fixture facilitates radio-frequency characterization of microwave and millimeter-wave integrated circuits. Includes base onto which two cosine-tapered ridge waveguide-to-microstrip transitions fastened. Length and profile of taper determined analytically to provide maximum bandwidth and minimum insertion loss. Each cosine taper provides transformation from high impedance of waveguide to characteristic impedance of microstrip. Used in conjunction with automatic network analyzer to provide user with deembedded scattering parameters of device under test. Operates from 26.5 to 40.0 GHz, but operation extends to much higher frequencies.

B89-10009

TRENDS IN SUSCEPTIBILITY TO SINGLE-EVENT UPSET

DONALD K. NICHOLS (Caltech), WILLIAM E. PRICE (Caltech), WOJCIECH A. KOLASINSKI (The Aerospace Corp.), RUKOTARO KOGA (The Aerospace Corp.), ALVIN E. WASKIEWICZ (Rockwell International Corp.), JAMES C. PICKEL (IRT Corp.), and JAMES T. BLANDFORD (IRT Corp.)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17147

Vol. 13, No. 1, P. 26

Report provides nearly comprehensive body of data on single-event upsets due to irradiation by heavy ions. Combines new test data and previously published data from governmental and industrial laboratories. Clear trends emerge from data useful in predicting future performances of devices.

B89-10010

SPREAD OF CHARGE FROM ION TRACKS IN INTEGRATED CIRCUITS

JOHN A. ZOUTENDYK (Caltech), HARVEY R. SCHWARTZ (Caltech), R. KEVIN WATSON (Caltech), and LELAND R. NEVILL (Micron Technology, Inc.)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17265

Vol. 13, No. 1, P. 27

Single-event upsets (SEU's) propagate to adjacent cells in integrated memory circuits. Findings of experiments in lateral transport of electrical-charge carriers from ion tracks in 256K dynamic random-access memories (DRAM's). As dimensions of integrated circuits decrease, vulnerability to SEU's increases. Understanding gained enables design of less vulnerable circuits.

B89-10011

IMPROVED BIPOLAR SEPARATOR FOR LEAD ACID BATTERIES

WALLY E. RIPPEL (Caltech), and DEAN B. EDWARDS (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15241

Vol. 13, No. 1, P. 28

New separator prolongs battery life. Design for bipolar separator consists of polyethylene plate and glass mats bonded to both faces of plate. Reduces loss of active material.

B89-10012

ENDURANCE TESTS OF AMORPHOUS-SILICON PHOTOVOLTAIC MODULES

RONALD G. ROSS, JR. (Caltech), and RUSSELL S. SUGIMURA (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17304

Vol. 13, No. 1, P. 28

Failure mechanisms in high-power service studied. Report discusses factors affecting endurance of amorphous-silicon solar cells. Based on field tests and accelerated aging of photovoltaic modules. Concludes that aggressive research needed if amorphous-silicon modules to attain 10-year life - value U.S. Department of Energy established as goal for photovoltaic modules in commercial energy-generating plants.

B89-10025

COMPREHENSIVE SILICON-SOLAR-CELL PROGRAM

MICHAEL F. LAMORTE (Research Triangle Institute), and WILLIAM M. YEAGER (Research Triangle Institute)

Jan. 1989 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17126

Vol. 13, No. 1, P. 44

Comprehensive Silicon Solar Cell Computer Modeling (SICELL) program simulates silicon solar cell. Predicts device parameters as efficiency, voltage-vs.-current characteristic fill factor, and temperature coefficients of parameters. Technique used similar to numerical-integration methods, but commonality described by use of mesh-point field. Validation studies show accuracies of simulations range from 0.08 percent to 3.6 percent for 27 experimental data points over temperature range of 300K to 421K. Results obtained by use of 10 mesh points in n- and p-type regions and for two iterations. SICELL runs interactively on VAX computer under VMS and written in VAX/VMS FORTRAN 77.

B89-10042

BIPOLAR BATTERY USING CONDUCTIVE-FIBER COMPOSITE
WALLY E. RIPPEL (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-14994

Vol. 13, No. 2, P. 20

Improved version of lead/sulfuric acid battery, electrically-conducting fiber/polymer composite substrates used in place of metallic substrates. Sealing and corrosion problems reduced. Benefits include halving of weight, increased energy and power densities, and lower gassing rate. Important for electric-vehicle development.

B89-10043

PHOTODIODE-COUPLED LIGHT MODULATOR

JOSEPH MASERJIAN (Caltech), and SVERRE T. ENG (Caltech)
Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16298

Vol. 13, No. 2, P. 22

Absorption of one light beam controls transmission of another. High-performance monolithic light modulator comprised of p-doped/intrinsic/n-doped (PIN) GaAs photodiode grown directly over InAs/GaAs PIN multiple-quantum-well (MQW) diode. Photodiode-coupled multiple-quantum-well modulator includes advanced semi-conductor microstructures enhancing electro-optical properties. Using standard lithographic and etching techniques for defining picture elements, structures fabricated into two-dimensional arrays for use as spatial light modulators.

B89-10044

REFLECTION-ZONE-PLATE ANTENNA

JOHN M. FRANKE, and BRADLEY D. LEIGHTY
Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13537

Vol. 13, No. 2, P. 23

Microwave antenna, based on reflection holography, designed and tested. Modified to produce arbitrary beam patterns by controlling relief pattern. Antenna planar or contoured to supporting structure. Low off-axis radar cross section at frequencies removed from operational frequency. Interference pattern produced by spherical wave intersecting plane wave consists of concentric circles similar to Newton's rings. Pattern identical to Fresnel zone plate, which has lens properties. Plane wave incident on hologram, or zone plate, focused to point.

B89-10045

CLOSED-LOOP MOTOR-SPEED CONTROL

MATTHEW A. SMITH (Rockwell International Corp.), RAY C. DELCHER (Rockwell International Corp.), and STEVEN W. HUSTON (Rockwell International Corp.)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29469

Vol. 13, No. 2, P. 26

Electronic motor-speed control circuit designed to operate in electrically noisy environment. Includes optoelectronic pick-up device, placed inside motor housing to provide speed feedback signal. Automatically maintains speed motor at commanded value. Measures speed of motor in terms of frequency of pulses of infrared light chopped by fan blades of motor. Difference between measured and commanded speeds serves as control signal for external amplifier driving motor. Major advantage of circuit is low cost.

B89-10046

MEASURING FRACTURE TIMES OF CERAMICS

PAUL J. SHLICHTA (Caltech), LEO BISTER (Caltech), and DONALD G. BICKLER (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16738

Vol. 13, No. 2, P. 26

Electrical measurements complement or replace fast cinematography. Electronic system measures microsecond time intervals between impacts of projectiles on ceramic tiles and fracture tiles. Used in research on ceramics and ceramic-based composite materials such as armor. Hardness and low density of ceramics enable them to disintegrate projectiles more efficiently than metals. Projectile approaches ceramic tile specimen. Penetrating foil squares of triggering device activate display and recording instruments. As ceramic and resistive film break oscilloscope plots increase in electrical resistance of film.

B89-10047

JACOBI-BESSEL ANALYSIS OF ANTENNAS WITH ELLIPTICAL APERTURES.

Y. RAHMAT-SAMII (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16967

Vol. 13, No. 2, P. 30

Coordinate transformation improves convergence pattern analysis of elliptical-aperture antennas. Modified version of Jacobi-Bessel expansion for vector diffraction analysis of reflector antennas uses coordinate transformation to improve convergence with elliptical apertures. Expansion converges rapidly for antennas with circular apertures, but less rapidly for elliptical apertures. Difference in convergence behavior between circular and elliptical Jacobi-Bessel algorithms indicated by highest values of indices m, n, and p required to achieve same accuracy in computed radiation pattern of offset paraboloidal antenna with elliptical aperture.

B89-10048

OPTOELECTRONIC TECHNIQUE ELIMINATES COMMON-MODE VOLTAGES

GARY G. LESNY

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14529

Vol. 13, No. 2, P. 32

Small signals transmitted between circuits at large differences of potential. Technique lends itself to accurate measurement of any electrical parameter and display of value. Accommodates broad range of measured values from millivolts to hundreds of volts and provides unlimited electrical isolation. Measured parameter converted to duration, proportional to value, of pulse of light. Transmitted along optical fiber to or from isolated circuit. Applications include operation of traveling-wave tubes or other electron-gun devices including filaments at cathode potential and measurement of current from, or control of series stacked power supplies. Used for optimization and testing of depressed-collector/microwave-tube combinations.

01 ELECTRONIC COMPONENTS AND CIRCUITS

B89-10049

ADVANCED COMPONENTS FOR FIBER-OPTICAL SYSTEMS

RAMON DEPAULA (Caltech), and DAVID W. STOWE (Aster Corp.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17080

Vol. 13, No. 2, P. 33

Paper reviews statuses of some advanced passive and active optical components for use with optical fibers. Emphasis on highly birefringent components controlling polarization, because control of polarization critical in applications as fiber-optical gyroscopes, interferometric sensors, and coherent communications.

B89-10053

ADAPTIVE FORCE AND POSITION CONTROL FOR ROBOTS

HOMAYOUN SERAJI (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17127

Vol. 13, No. 2, P. 41

Control system causes end effector of robot manipulator to follow prescribed trajectory and applies desired force or torque to object manipulating or in contact. Characterized by hybrid control architecture, where positions and orientations along unconstrained coordinate axes controlled by position-control subsystem, while forces and torques along constrained coordinate axes controlled by force-control subsystem. Compensates for dynamic cross-coupling between force-and position-control loops and does not require knowledge of complicated model of dynamics of manipulator and environment.

B89-10100

POSITION-AND-DIRECTION SENSOR FOR LIGHT BEAMS

MATTHEW A. SMITH (Rockwell International Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29275

Vol. 13, No. 3, P. 24

Optoelectronic sensor measures both position and direction of incidence of laser beam or other narrow beam of light. New sensor part of robotic welding system in which laser beam reflected from pool of molten metal and monitored by lateral-position sensor. To provide unambiguous measurement of both lateral position and direction of incident beam, sensor includes two position-sensitive photodetectors or linear arrays of photodetectors.

B89-10101

DELAY-LINE ANODE FOR MICROCHANNEL-PLATE SPECTROMETER

M. LAMPTON (University of California)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26073

Vol. 13, No. 3, P. 24

Photon-counting read-out system for microchannel-plate spectrometer includes delay line and timing circuit to measure wavelength coordinate and wedge/wedge charge-division system to measure orthogonal spatial coordinate. System proves advantageous for portable two-dimensional spectrometers having large image planes and for which design requirements include simplicity, reliability, low power consumption, and low mass.

B89-10102

CURRENT REGULATOR FOR SODIUM-VAPOR LAMPS

W. T. MCLYMAN (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-16702

Vol. 13, No. 3, P. 26

Regulating circuit maintains nearly-constant alternating current in sodium-vapor lamp. Regulator part of dc-to-ac inverter circuit used to supply power to street lamp from battery charged by solar-cell array.

B89-10103

INDUCTIVELY-ACTIVATED SHORT-INTERVAL TIMER

GORDON A. WIKER (Caltech), and GEORGE H. WELLS, JR. (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16882

Vol. 13, No. 3, P. 28

Timing circuit in pneumatically launched projectile triggers explosive charge in projectile at specified delay after launch. Both power and control signals coupled inductively to timer from stationary launcher circuitry. Eliminates need for direct electrical contacts, which are unreliable and generate sparks that trigger explosive accidentally. Inductive coupling also provides higher reliability in field operation than contacts. Concept useful in such other safety-related applications as remotely or automatically controlling flow of bottled flammable gas.

B89-10104

LOW-INDUCTANCE CAPACITOR FOR LOW TEMPERATURES

DAVID B. RHODES, STEPHEN B. JONES, and JOHN M. FRANKE

Mar. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13714

Vol. 13, No. 3, P. 30

Planar capacitor made on epoxy/fiberglass printed-circuit board. Planar design and flat copper plates ensure low inductance and low series resistance. Planar construction minimized effects of thermal contraction, and epoxy/fiberglass substrate ensured high breakdown voltage. Design is simple, and this type of capacitor easy for any printed-circuit-board facility to fabricate. Design suitable for any small-capacitance, high-voltage capacitor, whether operating at low or high temperature.

B89-10105

INTEGRATED-CIRCUIT BROADBAND INFRARED SOURCES

G. LAMB, M. JHABVALA, and A. BURGESS

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13085

Vol. 13, No. 3, P. 32

Microscopic devices consume less power, run hotter, and are more reliable. Simple, compact, lightweight, rapidly-responding reference sources of broadband infrared radiation made available by integrated-circuit technology. Intended primarily for use in calibration of remote-sensing infrared instruments, devices eventually replace conventional infrared sources. New devices also replace present generation of miniature infrared sources. Self-passivating nature of poly-crystalline silicon adds to reliability of devices. Maximum operating temperature is 1,000 K, and power dissipation is only one-fourth that of prior devices.

B89-10106

CHAIN OF TEST CONTACTS FOR INTEGRATED CIRCUITS

UDO LIENEWEG (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16784

Vol. 13, No. 3, P. 34

Test structure forms chain of 'cross' contacts fabricated together with large-scale integrated circuits. If necessary, number of such

chains incorporated at suitable locations in integrated-circuit wafer for determination of fabrication yield of contacts. In new structure, resistances of individual contacts determined: In addition to making it possible to identify local defects, enables generation of statistical distributions of contact resistances for prediction of 'parametric' contact yield of fabrication process.

B89-10107**PROTECTION AGAINST BRIEF INTERRUPTIONS OF POWER**
THEODORE A. CASAD (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16768**Vol. 13, No. 3, P. 35**

Rotating standby power system compensates for brief interruptions in commercial power supply. System furnishes few cycles of alternating current from its stored rotational energy. Protects equipment vulnerable to brief losses of power; for example, prevents computers from erroneously suppressing or adding bits to data being handled at moment of power failure.

B89-10153**STABLE 1.25-W CW METHANOL LASER**

JAM FARHOOMAND (Caltech), and HERBERT M. PICKETT (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17346**Vol. 13, No. 4, P. 22**

Far-infrared (FIR) laser operating at 119-micrometer-wavelength transition of methanol achieves very low drift in frequency. Continuous-wave (CW) FIR output is 1.25 W when laser pumped by 125-W commercial CO₂ laser. Rate of drift of output frequency less than plus or minus 100 kHz per hour because laser designed to have low thermal-expansion coefficients and because temperatures of input and output couplers held within 0.1 degree C of fixed values.

B89-10154**SPECTRUM-MODULATING FIBER-OPTIC SENSORS**

GLENN BEHEIM, and KLAUS FRITSCH (John Carroll Univ.)

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17700)

LEW-14662**Vol. 13, No. 4, P. 24**

Family of spectrum-modulating fiber-optic sensors undergoing development for use in aircraft-engine control systems. Fiber-optic sensors offer advantages of small size, high bandwidth, immunity to electromagnetic interference, and light weight. Furthermore, they reduce number of locations on aircraft to which electrical power has to be supplied.

B89-10155**METAL FILM INCREASES CCD QUANTUM EFFICIENCY**

JAMES R. JANESICK (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16815**Vol. 13, No. 4, P. 24**

Thin layer of platinum or other high-work-function metal applied to back side of rear-illuminated charge-coupled device (CCD) achieves quantum efficiency (QE)-pinned state, an ideal condition allowing sensor to achieve 100-percent internal charge-collection efficiency within its photosensitive volume. Metal layer, called flash gate, easily applied by tungsten vacuum deposition during last step of sensor fabrication.

B89-10156**OUTPUT-ISOLATION AND PROTECTION CIRCUIT**

CHARLES A. WAGNER, and GARY V. KELLOGG

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11834**Vol. 13, No. 4, P. 26**

Output-isolation circuit couples precise analog signals (-10 to +10 V, 0 to 20 kHz) from computer or from other electronic equipment to external electronic equipment that may be at different ground potential. Circuit functions in presence of common-mode voltages up to 2,500 Vac or 3,500 Vdc. To prevent damage from accidental connection of output leads to powerlines or other sources of high voltage, circuit includes features that protect input and output signal lines against normal-mode overvoltages up to 120 V ac or dc.

B89-10157**INCREASING AND COMBINING OUTPUTS OF SEMICONDUCTOR LASERS**

JOSEPH KATZ (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17473**Vol. 13, No. 4, P. 30**

Paper reviews methods of increasing and combining outputs of semiconductor lasers, with references to literature of recent years (mostly 1986 and 1987). This is a field of great practical importance: Necessary to increase or combine outputs of individual lasers to obtain sufficient power for such uses as communication, ranging, remote sensing, printing, and pumping solid-state lasers.

B89-10158**OPTICALLY-CONTROLLED MICROWAVE DEVICES AND CIRCUITS**

KUL B. BHASIN, and RAINEE N. SIMONS

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23900)

LEW-14710**Vol. 13, No. 4, P. 31**

NASA Technical Memorandum discusses physical basis and dc and microwave characteristics of optically-controlled microwave devices described in literature. Emphasis on responses of GaAs/GaAlAs high-electron-mobility transistors (HEMT's) and GaAs metal/semiconductor field-effect transistors (MESFET's) to light. Devices used to detect radio-frequency modulation of optical signals, to control gains of amplifiers, and to provide injection locking of oscillators.

B89-10159**IGNITER SIMULATOR**

RICHARD A. SIMON (Rockwell International Corp.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29402**Vol. 13, No. 4, P. 31**

Report describes electronic circuitry that simulates electrical properties of igniter of Space Shuttle main engine. Circuit used to test software of engine controller, without having to fire real igniter or turn on engine. Circuit used in all igniter simulations and mimics operation of igniter more realistically than did previous versions.

B89-10211**COMPOSITE SEMICONDUCTOR SUBSTRATES**

AKBAR NOUHI (Caltech), GOURI RADHAKRISHNAN (Caltech), JOSEPH KATZ (Caltech), and KRIS KOLIWAD (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

01 ELECTRONIC COMPONENTS AND CIRCUITS

NPO-17342 Vol. 13, No. 5, P. 22

Epitaxial structure of three semiconductor materials - silicon, gallium arsenide, and cadmium telluride - makes possible integrated monolithic focal-plane arrays of photodetectors. Silicon layer contains charge-coupled devices, gallium arsenide layer contains other fast electronic circuitry, and cadmium telluride layer serves as base for array of mercury cadmium telluride infrared sensors. Technique effectively combines two well-established techniques; metalorganic chemical-vapor deposition (MOCVD) and molecular-beam epitaxy (MBE). Multilayer structure includes HgCdTe light sensors with Si readout devices and GaAs signal-processing circuits. CdTe layer provides base for building up HgCdTe layer.

B89-10212 **COMPUTING RESONANCES OF WAVEGUIDE-TO-MICROSTRIP TRANSITIONS**

GEORGE E. PONCHAK, and ALAN N. DOWNEY
May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16958)

LEW-14637 Vol. 13, No. 5, P. 22

Simplified mathematical model used to predict resonant frequencies of antipodal-finline waveguide-to-microstrip transitions. Makes it possible to place undesired resonances outside desired frequency band during design process; eliminates much of iteration in design process and thereby reduces both time and cost of design.

B89-10213 **BARIUM-DISPENSER THERMIONIC CATHODE**

EDWIN G. WINTUCKY, M. GREEN (Varian Associates, Inc.), and M. FEINLEIB (Varian Associates, Inc.)
May 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14685 Vol. 13, No. 5, P. 24

Improved reservoir cathode serves as intense source of electrons required for high-frequency and often high-output-power, linear-beam tubes, for which long operating lifetime important consideration. High emission-current densities obtained through use of emitting surface of relatively-low effective work function and narrow work-function distribution, consisting of coat of W/Os deposited by sputtering. Lower operating temperatures and enhanced electron emission consequently possible.

B89-10214 **METAL COAT INCREASES OUTPUT SENSITIVITY**

JAMES R. JANESICK (Caltech)
May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16963 Vol. 13, No. 5, P. 26

Charge-coupled photodetector optimized for maximum quantum efficiency (QE), high charge-collection efficiency, and ultralow read noise. Called 'flash-coupled' photodetector, sensor delivers high quantum-efficiency sensitivity in spectral range extending from soft x ray to near infrared.

B89-10215 **IMPROVED COPLANAR WAVEGUIDES**

RAINEE N. SIMONS
May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20469)

LEW-14642 Vol. 13, No. 5, P. 28

Three new types of coplanar waveguide transmission lines proposed: suspended, striplinelike suspended, and inverted. Numerical analyses of propagation of electromagnetic fields of new and of more-conventional plain and conductor-backed coplanar waveguides showed new waveguides offered several

advantages over conventional ones. Configurations promise lower attenuation and reduce effects of manufacturing errors.

B89-10216 **MICROTROPIC FLOW TRANSDUCER**

GALE R. SUNDBERG, H. T. HENDERSON (University of Cincinnati), and M. WALTER HSIEH (University of Cincinnati)
May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14654 Vol. 13, No. 5, P. 29

Novel microelectronic airflow and gas-flow transducer developed. Has no moving parts and constructed by use of variation on ordinary technology for processing of planar silicon microelectronics, where hundreds or thousands of identical devices concurrently produced on single chip as easily as can one. Gas-flow transducer based upon integrated Wheatstone bridge in silicon chip. Legs doped with gold and isolated thermally by etching away surrounding material (except corners). Because of small size, sensitivity, and good directional capability of new transducer, numerous potential applications in measurement of vortexes, flows in inlets to pipes, and other complicated flows.

B89-10270 **ULTRA-STABLE SUPERCONDUCTING-MASER OSCILLATOR**

DONALD M. STRAYER (Caltech), and G. JOHN DICK (Caltech)
Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17090 Vol. 13, No. 6, P. 22

Unprecedented stability of frequency in superconducting, triple-cavity ruby maser oscillator achieved by incorporation of amplitude-control subsystem. New design enhances ultra-stable measurements of time by reducing fluctuations to 2×10^{-10} to negative 19th power routinely, and to as little as 10^{-20} to negative 20th power in exceptional cases. Currents induced in superconducting pickup coil by changes in magnetic field in ruby. Currents from coil fed to superconducting quantum-interference device (SQUID) magnetometer, output used to generate control signal for electronically variable attenuator. Attenuator varies pump-signal amplitude in response to magnetic-field fluctuations in ruby. Very high feedback-loop gain used for sensitivity of control and adequate compensation of fluctuations.

B89-10271 **HIGH-PERFORMANCE POWER-SEMICONDUCTOR PACKAGES**

DAVID RENZ, IRVING HANSEN, and ALBERT BERMAN (Microsemi Corp.)
Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-28825)

LEW-14818 Vol. 13, No. 6, P. 24

A 600-V, 50-A transistor and 1,200-V, 50-A diode in rugged, compact, lightweight packages intended for use in inverter-type power supplies having switching frequencies up to 20 kHz. Packages provide low-inductance connections, low loss, electrical isolation, and long-life hermetic seal. Low inductance achieved by making all electrical connections to each package on same plane. Also reduces high-frequency losses by reducing coupling into inherent shorted turns in packaging material around conductor axes. Stranded internal power conductors aid conduction at high frequencies, where skin effect predominates. Design of packages solves historical problem of separation of electrical interface from thermal interface of high-power semiconductor device.

B89-10272 **ASYMMETRICAL SRAM CELLS FOR RADIATION TESTS**

MARTIN G. BUEHLER (Caltech)
Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-16890**Vol. 13, No. 6, P. 26**

Features of circuits altered to increase or decrease sensitivity to radiation. State-space analysis used to analyze single-event-upset behavior of memory cell. When voltage on node a is set at one of indicated initial values V_{ao} and then released, voltages on nodes a and b then follow indicated trajectory to final logic 'one' or logic 'zero' state. Ability to do this important for design of radiation-detecting integrated circuits (deliberately made more sensitive to ionizing radiation) and 'radiation-hardened' integrated circuits - those intended to be relatively invulnerable to intense radiation.

B89-10273**ADVANCED FUEL-CELL MODULES**

WILLIAM F. BELL, III (International Fuel Cells Corp.), RONALD E. MARTIN (International Fuel Cells Corp.), ALBIN J. STRUNING (International Fuel Cells Corp.), and ROBERT WHITEHILL (International Fuel Cells Corp.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21338**Vol. 13, No. 6, P. 28**

Modules designed for long life, light weight, reliability, and low cost. Stack of alkaline fuel cells based on modules, consisting of three fuel cells and cooler. Each cell includes following components: ribbed carbon fine-pore anode electrolyte-reservoir plate; platinum-on-carbon catalyst anode; potassium titanate matrix bonded with butyl rubber; gold-plated nickel-foil electrode substrates; and silver plated, gold-flashed molded polyphenylene sulfide cell holder. Each cell has active area of 1ft to the 2nd power (0.09 m to the 2nd power). Materials and configurations of parts chosen to extend life expectancy, reduce weight and manufacturing cost, and increase reliability.

B89-10274**MONOLITHIC III-V/SILICON SPATIAL LIGHT MODULATOR**

JOSEPH MASERJIAN (Caltech), and SVERRE T. ENG (Caltech)
Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16916**Vol. 13, No. 6, P. 28**

Current techniques for growth of device-quality GaAs on silicon substrates enables fabrication of silicon-based version of photodiode-coupled spatial light modulator. Monolithic photodiode-coupled light-modulator array constructed on silicon substrate by growing InAs/GaAs multiple-quantum-wells over silicon PIN diode layer. Intermediate GaAs buffer layer confines lattice-misfit dislocations to vicinity of silicon. Use of silicon makes available wider range of auxiliary on-chip signal-processing circuitry for coding and decoding of data, addition or subtraction of brightness levels, spatial reformatting, and rescaling.

B89-10275**STABILIZING SEMICONDUCTOR DEVICES WITH HYDROGEN**

ALBERT W. OVERHAUSER (Caltech), and JOSEPH MASERJIAN (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17187**Vol. 13, No. 6, P. 30**

Damage by radiation healed rapidly. Feature provides continuous, rapid recovery of devices from degradation caused by hot electrons, photons, and ionizing radiation. Several candidate sites for palladium film catalysts, inserted during manufacture as integral parts of devices. Palladium films made by evaporation, sputtering, or chemical-vapor deposition. If additional storage required, thick layer of palladium plated on inside of package surrounding device. Hydrogen stored by exposing palladium to hydrogen gas just before package sealed hermetically.

B89-10276**ADVANCED SMALL RECHARGEABLE BATTERIES**

GERALD HALPERT (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17396**Vol. 13, No. 6, P. 32**

Lithium-based units offer highest performance. Paper reviews status of advanced, small rechargeable batteries. Covers aqueous systems including lead/lead dioxide, cadmium/nickel oxide, hydrogen/nickel oxide, and zinc/nickel oxide, as well as nonaqueous systems. All based on lithium anodes, nonaqueous systems include solid-cathode cells (lithium/molybdenum disulfide, lithium/titanium disulfide, and lithium/vanadium oxide); liquid-cathode cells (lithium/sulfur dioxide cells); and new category, lithium/polymer cells.

B89-10301**COMPUTER-AIDED ENGINEERING OF CABLING**

JOSEPH W. BILLITTI (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17391**Vol. 13, No. 6, P. 68**

Program generates data sheets, drawings, and other information on electrical connections. DFACS program, centered around single data base, has built-in menus providing easy input of, and access to, data for all personnel involved in system, subsystem, and cabling. Enables parallel design of circuit-data sheets and drawings of harnesses. Also recombines raw information to generate automatically various project documents and drawings, including index of circuit-data sheets, list of electrical-interface circuits, lists of assemblies and equipment, cabling trees, and drawings of cabling electrical interfaces and harnesses. Purpose of program to provide engineering community with centralized data base for putting in, and gaining access to, functional definition of system as specified in terms of details of pin connections of end circuits of subsystems and instruments and data on harnessing. Primary objective to provide instantaneous single point of interchange of information, thus avoiding

B89-10338**MULTICHANNEL, ACTIVE LOW-PASS FILTERS**

JAMES J. LEV (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17290**Vol. 13, No. 7, P. 20**

Multichannel integrated circuits cascaded to obtain matched characteristics. Gain and phase characteristics of channels of multichannel, multistage, active, low-pass filter matched by making filter of cascaded multichannel integrated-circuit operational amplifiers. Concept takes advantage of inherent equality of electrical characteristics of nominally-identical circuit elements made on same integrated-circuit chip. Characteristics of channels vary identically with changes in temperature. If additional matched channels needed, chips containing more than two operational amplifiers apiece (e.g., commercial quad operational amplifiers) used. Concept applicable to variety of equipment requiring matched gain and phase in multiple channels - radar, test instruments, communication circuits, and equipment for electronic countermeasures.

B89-10339**EFFICIENT CAVITY-DUMPED, FREQUENCY-DOUBLED ND:YAG LASER**

D. L. ROBINSON (Caltech), and D. L. SIPES (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

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NPO-17286 Vol. 13, No. 7, P. 22

New design expected to increase efficiency of cavity-dumped, frequency-doubled Nd:YAG laser. Frequency doubled outside primary laser resonator, and portion of fundamental-frequency light not used by doubler returned to primary laser cavity to increase efficiency. Applications of laser foreseen in data communications, laser ranging, studies of atmosphere, remote sensing, and laboratory studies.

B89-10340 **SYNCHRONOUS HALF-WAVE RECTIFIER**

WALLY E. RIPPEL (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17220 Vol. 13, No. 7, P. 24

Synchronous rectifying circuit behaves like diode having unusually low voltage drop during forward-voltage half cycles. Circuit particularly useful in power supplies with potentials of 5 Vdc or less, where normal forward-voltage drops in ordinary diodes unacceptably large. Fabricated as monolithic assembly or as hybrid. Synchronous half-wave rectifier includes active circuits to attain low forward voltage drop and high rectification efficiency.

B89-10341 **FIELD-SEQUENTIAL COLOR CONVERTER**

VICTOR J. STUDER

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21346 Vol. 13, No. 7, P. 24

Electronic conversion circuit enables display of signals from field-sequential color-television camera on color video camera. Designed for incorporation into color-television monitor on Space Shuttle, circuit weighs less, takes up less space, and consumes less power than previous conversion equipment. Incorporates state-of-art memory devices, also used in terrestrial stationary or portable closed-circuit television systems.

B89-10342 **HOTSPOT ENDURANCE OF SOLAR-CELL MODULES**

C. C. GONZALEZ (Caltech), R. S. SUGIMURA (Caltech), and R. G. ROSS, JR. (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17305 Vol. 13, No. 7, P. 28

Procedure for evaluating modules for use with concentrators now available. Solar simulator illuminates photovoltaic cells through Fresnel lens of concentrator module. Module and test cells inspected visually at 24-h intervals during test and again when test completed. After test, electrical characteristics of module measured for comparison with pretest characteristics.

B89-10343 **TWISTED PAIR OF INSULATED WIRES SENSES MOISTURE**

ERIC G. LAUE (Caltech), and JAMES B. STEPHENS (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17111 Vol. 13, No. 7, P. 30

Sensitivity of electronic moisture sensor to low levels of moisture increased by new electrode configuration. Moisture-sensing circuit described in 'Low-Cost Humidity Sensor' (NPO-16544). New twisted pair of wires takes place of flat-plate capacitor in circuit. Configuration allows for thermal expansion and contraction of polymer while maintaining nearly constant area of contact between polymer and wires.

B89-10386 **REFLECTION OSCILLATORS CONTAINING** **SERIES-RESONANT CRYSTALS**

LEONARD E. KLEINBERG

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13173 Vol. 13, No. 8, P. 20

Crystal-controlled transistor reflection oscillator easily tunable and stable, consumes little power, and costs less than other types of oscillators operating at same frequencies. Made possible by design concept that includes operation of transistor well beyond 3-dB frequency of current-versus-frequency curve. Concept takes advantage of newly available crystals resonating at frequencies up to about 1 GHz. Useful in determining approximate frequency of oscillation and major elements determining frequency.

B89-10387 **MULTIPLYING VIDEO MIXER**

NEIL W. HECKT (Boeing Aerospace Co.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17332 Vol. 13, No. 8, P. 22

Video mixing circuit places transparent overlay image on all or portion of normal image on television screen. Overlay computer-generated graphics, text, or another image. Background video brightness signal fed into one input terminal of circuit, while overlay brightness signal fed into other input terminal. Amplitude of background brightness signal modulated by overlay brightness signal, resulting in video image in which background image appears as though viewed through overlay. Multiplying video mixer, combined with additional circuitry, places transparent or opaque overlay images on normal (background) video images.

B89-10388 **MONOLITHIC MICROWAVE SWITCHING MATRIX**

GENE FUJIKAWA, DANIEL R. CH'EN (Microwave Monolithics, Inc.), and WENDELL C. PETERSEN (Microwave Monolithics, Inc.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14813 Vol. 13, No. 8, P. 22

Gallium arsenide integrated-circuit chip switches any of three microwave input signals to any of three output ports. Measuring 4.9 mm on side, chip contains nine field-effect transistor (FET) crosspoint switches. Housed in custom-designed package with standard connectors for easy integration into system. FET's on chip operated as passive switches and consume no static power and insignificant amounts of switching power. Chip module cascades with similar modules into large arrays handling as many as 100 inputs and 100 outputs. Applications include switching and routing vast amounts of data between computers at extremely high speed. On communications satellite, chip switches microwave signals to and from Earth stations and other satellites.

B89-10389 **PREDICTION OF CRITICAL CRACK SIZES IN SOLAR CELLS**

CHERN P. CHEN (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17637 Vol. 13, No. 8, P. 24

Report presents theoretical analysis of cracking in Si and GaAs solar photovoltaic cells subjected to bending or twisting. Analysis also extended to predict critical sizes for cracks in Ge substrate coated with thin film of GaAs. Analysis leads to general conclusions. Approach and results of study useful in development of guidelines for acceptance or rejection of slightly flawed cells during manufacture.

B89-10390**ENCAPSULANTS AND CORROSION IN PHOTOVOLTAIC MODULES**

GORDON R. MON (Caltech), LIANG-CHI WEN (Caltech), and RONALD G. ROSS, JR. (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17352**Vol. 13, No. 8, P. 24**

Paper reports studies of effects of moisture on photovoltaic modules, presenting data useful in further quantitative studies of such phenomena. Measured data used in computer simulation of two-dimensional conduction to analyze ionic-conduction characteristics of PVB- and EVA-encapsulated modules. Notes encapsulant plays important role in electrochemical processes in photovoltaic module. Indicates how variations in design parameters affect levels of leakage currents in modules. Points out likely leakage-current paths in modules at various temperatures and humidities. Compares results of field and laboratory tests of same specimens and notes greater severity of outdoor environment.

B89-10391**RELATIONSHIP BETWEEN LATCHUP AND TRANSISTOR CURRENT GAIN**

LARRY D. EDMONDS (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17561**Vol. 13, No. 8, P. 26**

Theoretical study takes new look at current-vs.-voltage behavior of silicon controlled rectifiers (SCR's), four-layer complementary metal oxide/semiconductor (CMOS) devices, and similar devices susceptible to latchup. For purposes of analysis, 'latchup' denotes transition of such device from lower-current-conducting steady state to distinct higher-current-conducting steady state. Focuses upon conventional two-couple-transistor model of one-dimensional SCR. Although model gives oversimplified view of latchup in CMOS circuits, useful for qualitative predictions of electrical characteristics.

B89-10426**TEST STRUCTURES FOR BUMPY INTEGRATED CIRCUITS**

MARTIN G. BUEHLER (Caltech), and HOSHYAR R. SAYAH (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17393**Vol. 13, No. 9, P. 20**

Cross-bridge resistors added to comb and serpentine patterns. Improved combination of test structures built into integrated circuit used to evaluate design rules, fabrication processes, and quality of interconnections. Consist of meshing serpentines and combs, and cross bridge. Structures used to make electrical measurements revealing defects in design or fabrication. Combination of test structures includes three comb arrays, two serpentine arrays, and cross bridge. Made of aluminum or polycrystalline silicon, depending on material in integrated-circuit layers evaluated. Aluminum combs and serpentine arrays deposited over steps made by polycrystalline silicon and diffusion layers, while polycrystalline silicon versions of these structures used to cross over steps made by thick oxide layer.

B89-10427**PARABOLOIDAL ANTENNA RADIATES FAN OR PENCIL BEAMS**

JOHN HUANG (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17503**Vol. 13, No. 9, P. 24**

Shape of beam determined by type of feed. Theory and

experiments show same paraboloidal antenna reflector used to radiate pencil beam or fan beam, depending on configuration of feed. Although pencil-shaped beam desirable in many applications, fan-shaped beam preferred in some scanning-radar and mapping-radar systems. Experiment performed with paraboloidal reflector having focal length of 48 in. (1.22 m) and diameter of 3.65 m. Shows fan beams generated in this way and not seriously distorted by feed offsets tested. Also shows because reflector in near field of feed, fan beam not necessarily focused by placing feed at focal plane.

B89-10428**SQUID WITH INTEGRAL FLUX CONCENTRATOR**

PALMER N. PETERS, and ROBERT C. SISK

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28282**Vol. 13, No. 9, P. 26**

In improved superconducting quantum interference device (SQUID), change in size and shape of superconducting ring improves coupling to external signal coil and eases coil-positioning tolerances. More rugged and easier to manufacture than conventional SQUID's with comparable electrical characteristics. Thin-film superconducting flux concentrator utilizes Meissner effect to deflect magnetic field of signal coil into central hole of SQUID. Used in magnetometers, ammeters, analog-to-digital converters, and related electronic applications in which high signal-to-noise ratios required.

B89-10429**SIMPLE MULTIPLEXING HAND-HELD CONTROL UNIT**

BLAKE HANNAFORD (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17308**Vol. 13, No. 9, P. 28**

Multiplexer consists of series of resistors, each shunted by single-pole, single-throw switch. User operates switches by pressing buttons or squeezing triggers. Prototype includes three switches operated successfully in over 200 hours of system operations. Number of switches accommodated determined by signal-to-noise ratio of current source, noise induced in control unit and cable, and number of bits in output of analog-to-digital converter. Because many computer-controlled robots have extra analog-to-digital channels, such multiplexer added at little extra cost.

B89-10430**HONEYCOMB-FIN HEAT SINK**

WALLY E. RIPPEL (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17198**Vol. 13, No. 9, P. 28**

Improved finned heat sink for electronic components more lightweight, inexpensive, and efficient. Designed for use with forced air, easily scaled up to dissipate power up to few hundred watts. Fins are internal walls of aluminum honeycomb structure. Cell structure gives strength to thin aluminum foil. Length of channels chosen for thermodynamic efficiency; columns of cells combined in any reasonable number because flowing air distributed to all. Heat sink cools nearly as effectively at ends as near its center, no matter how many columns of cells combined.

B89-10431**SINGLE ELECTRODE WOULD CONTROL CHARGE-COUPLED DEVICE**

MARK WADSWORTH (Texas Instruments, Inc.), and ROBERT D. MCGRATH (Texas Instruments, Inc.)

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NPO-17313 Vol. 13, No. 9, P. 30

Space saved and interelectrode short circuits eliminated. Proposed virtual-phase, interline-transfer, charge-couple device uses single gate electrode to control both interline and intraline transfer of charge. Voltage on single control electrode varied to transfer charge from photosites to shift register, or else along shift register. Two kinds of transfer independent of each other. Charge transferred along shift register when voltage on control electrode alternated between gate potentials.

B89-10432

RADIATION DAMAGE IN ADVANCED BIPOLAR TRANSISTORS

JOHN A. ZOUTENDYK (Caltech), CHARLES A. GOBEN (Southern Illinois Univ.), and DALE F. BERNDT (Honeywell, Inc.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17570 Vol. 13, No. 9, P. 32

Report describes measurements of common-emitter current gains (hFE) of advanced bipolar silicon transistors before, during, and after irradiation with 275-MeV bromine ions, 2.5-MeV electrons, and conductivity rays from cobalt-60 atoms.

B89-10494

Q-SWITCH FOR SELF-INJECTION LOCKING OF LASER

NORMAN P. BARNES

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13772 Vol. 13, No. 10, P. 20

Proposed scheme for improved electro-optical switching (Q switching) of pulsed, self-injection-locked laser involves sensing of and compensation for level of pumping light. Decreases spectral width of laser pulse and makes it independent of pumping level. Laser operated in high-loss condition during initial evolution of pulse. During this time, light makes many round trips through laser resonator. Once small laser pulse evolves in high-loss condition in laser resonator, optical configuration of resonator switched to one of low loss. In low-loss state, majority of energy extracted in efficient manner while retaining narrow spectral width of initial pulse. Beneficial in reducing jitter.

B89-10495

INTEGRATED SEMICONDUCTOR/OPTICAL INFORMATION PROCESSORS

LI-JEN CHENG (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17533 Vol. 13, No. 10, P. 22

Optical information processors made of integrated three-dimensional devices which include optical, electro-optical, and electronic devices. Integration achieved by combination and extension of advanced semiconductor (integrated-circuit) and integrated-optics technology. In integrated device, spatial light modulator fabricated on surface of chip. Leads to miniaturization of sophisticated optical information-processing systems.

B89-10496

PIEZOELECTROSTATIC GENERATOR

GLEN A. ROBERTSON

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28298

Vol. 13, No. 10, P. 24

High voltage generated by compact, lightweight equipment. Improved variable-capacitance electrostatic generator relies on piezoelectric effort to convert mechanical energy directly into electrical energy and contains neither transformers nor bulky high-voltage rectifiers. Requires neither external power supply to charge, nor vacuum to insulate electrodes.

B89-10497

SEU IN AN ADVANCED BIPOLAR INTEGRATED CIRCUIT

JOHN A. ZOUTENDYK (Caltech), ELAINE C. SECREST (Caltech), and DALE F. BERNDT (Honeywell, Inc.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17553 Vol. 13, No. 10, P. 26

Report summarizes investigation of single-event upsets (SEU) in bipolar integrated-circuit set of flip-flops (memory cells). Device tested made by advanced digital bipolar silicon process of Honeywell, Inc. Circuit chip contained 4 cells. Construction enabled study of effect of size on SEU behavior. Each cell externally biased so effect of bias current on SEU behavior. Results of study provides important information for optimal design of devices fabricated using buried-layer bipolar process operating in heavy-ion SEU environments. Designers use information to provide required levels of suppression of SEU in specific applications via combinations of size and/or cell-current scaling.

B89-10538

ELECTRONIC ROTATOR FOR SHEET OF LASER LIGHT

JOHN M. FRANKE, DAVID B. RHODES, BRADLEY D. LEIGHTY, and STEPHEN B. JONES

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13836 Vol. 13, No. 11, P. 20

Primary flow-visualization system in Basic Aerodynamic Research Tunnel (BART) at NASA Langley Research Center is sheet of laser light generated by 5-W argon-ion laser and two-axis mirror galvanometer scanner. Generates single and multiple sheets of light, which remain stationary or driven to sweep out volume. Sine/cosine potentiometer used to orient two galvanometer/mirror devices simultaneously and yields desired result at reasonable cost and incorporated into prototype in 1 day.

B89-10539

BIOMEDICAL TELELECTRODES

C. K. SHEPHERD (Lockheed Engineering and Sciences Co.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21501 Vol. 13, No. 11, P. 22

Compact transmitters eliminate need for wires to monitors. Biomedical teleelectrode is small electronic package that attaches to patient in manner similar to small adhesive bandage. Patient wearing biomedical teleelectrodes moves freely, without risk of breaking or entangling wire connections. Especially beneficial to patients undergoing electrocardiographic monitoring in intensive-care units in hospitals. Eliminates nuisance of coping with wire connections while dressing and going to toilet.

B89-10540

VARIABLE-RESISTIVITY MATERIAL FOR MEMORY CIRCUITS

GANESAN NAGASUBRAMANIAN (Caltech), SALVADOR DISTEFANO (Caltech), and JOVAN MOACANIN (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17425 Vol. 13, No. 11, P. 22

Nonvolatile memory elements packed densely. Electrically-erasable, programmable, read-only memory matrices made with newly-synthesized organic material of variable electrical resistivity. Material, polypyrrole doped with tetracyanoquinhydrone (TCNQ), changes reversibly between insulating or higher-resistivity state and conducting or low-resistivity state. Thin film of conductive polymer separates layer of row conductors from layer of column conductors. Resistivity of film at each intersection and, therefore, resistance of memory element defined by row and column, increased or decreased by application of suitable switching voltage. Matrix circuits made with this material useful for experiments in associative electronic memories based on models of neural networks.

B89-10541**ELECTRODES FOR ALKALI-METAL THERMOELECTRIC CONVERTERS**

ROGER M. WILLIAMS (Caltech), BOB L. WHEELER (Caltech), BARBARA JEFFRIES-NAKAMURA (Caltech), JAMES L. LAMB (Caltech), C. PERRY BANKSTON (Caltech), and TERRY COLE (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17159**Vol. 13, No. 11, P. 24**

Combination of thin, porous electrode and overlying collector grid reduces internal resistance of alkali-metal thermoelectric converter cell. Low resistance of new electrode and grid boosts power density nearly to 1 W/cm² of electrode area at typical operating temperatures of 1,000 to 1,300 K. Conductive grid encircles electrode film on alumina tube. Bus wire runs along tube to collect electrical current from grid. Such converters used to transform solar, nuclear, and waste heat into electric power.

B89-10542**ALTERNATING-GRADIENT PHOTODETECTOR FOR FAR INFRARED**

ALBERT W. OVERHAUSER (Caltech), and JOSEPH MASERJIAN (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17235**Vol. 13, No. 11, P. 26**

Proposed detector of photons of wavelengths in range of 30 to 200 micrometer made of alternating layers of lightly and heavily negatively doped germanium. Formed in sequence by conventional chemical-vapor deposition. Alternating-gradient structure enhances collection of photogenerated charge carriers while suppressing dark current, thus achieving high detectivity. Alternating layers of n+ and n- germanium provides high detectivity in far-infrared spectral region. Also possible to make similar structures with positive doping and with other semiconductors as silicon or gallium arsenide to obtain various spectral response.

B89-10543**HALL-EFFECT CURRENT SENSORS FOR INTEGRATED CIRCUITS**

WALLY E. RIPPEL (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17476**Vol. 13, No. 11, P. 28**

Built-in devices measure direct or alternating currents. Hall-effect sensors placed near constriction in conductor strip. Differential configuration reduces effects of stray magnetic fields, nonlinearities, and changes in temperature. Preliminary design studies and experiments with macroscopic commercial Hall-effect sensors conducted to assess feasibility, limitations, and need for further research and development of this concept. Potential

applications include programmable power supplies and protective circuitry.

B89-10544**N-BIT BINARY RESISTOR**

PING TCHENG

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13709**Vol. 13, No. 11, P. 29**

Binary resistors in series tailored to precise value of resistance. Desired value of resistance obtained by cutting appropriate traces across resistors. Multibit, binary-based, adjustable resistor with high resolution used in many applications where precise resistance required.

B89-10590**PLANAR ANTENNAS ON THICK DIELECTRIC SUBSTRATES**

K. A. LEE (Caltech), and M. A. FRERKING (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17466**Vol. 13, No. 12, P. 26**

Features include ease of fabrication and wide range of operating frequencies. Planar antennas on thick dielectric substrates built for use at millimeter wavelengths from 40 to 400 GHz. Antennas of this type quasi-optical structures, for which expensive, precisely machined waveguides not required. Made easily by standard photolithography and integrated with planar mixers or detectors to form arrays.

B89-10591**MEMORY SWITCHES BASED ON MNO₂-X THIN FILMS**

RAJESHUNI RAMESHAM (Caltech), ANILKUMAR P. THAKOOR (Caltech), and JOHN LAMBE (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17377**Vol. 13, No. 12, P. 28**

Thin films of MnO₂-x at intersections between metallic row and column conductors serve as switching elements for nonvolatile electronic memories. 'On'-state resistance adjustable, and on-to-off transition irreversible. Elements electrically programmable and especially suitable for use in associative electronic memories based on neural-network concepts.

B89-10592**RESISTANCE WELDER USING 480-VAC GROUND-FAULT INTERRUPTER**

STEVEN W. HUSTON (Rockwell International Corp.), RALPH E. KROY (Rockwell International Corp.), and DOUGLAS I. MACFARLANE (Rockwell International Corp.)

Dec. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29582**Vol. 13, No. 12, P. 28**

Use of ground-fault interrupters in 480-Vac power supplies of portable resistance welding machines proposed. Enhances safety and quality of welds by detecting damage in long power cable to portable resistance welder.

B89-10593**INTERNAL CORRECTION OF ERRORS IN A DRAM**

JOHN A. ZOUTENDYK (Caltech), R. KEVIN WATSON (Caltech), HARVEY R. SCHWARTZ (Caltech), LELAND R. NEVILL (Micron Technology, Inc.), and ZILLE HASNAIN (Micron Technology, Inc.)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17406**Vol. 13, No. 12, P. 30**

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Error-correcting Hamming code built into circuit. A 256 K dynamic random-access memory (DRAM) circuit incorporates Hamming error-correcting code in its layout. Feature provides faster detection and correction of errors at less cost in amount of equipment, operating time, and software. On-chip error-correcting feature also makes new DRAM less susceptible to single-event upsets.

B89-10594

GROUND-SENSING CIRCUIT FOR ARC WELDERS

RICHARD K. BURLEY (Rockwell International Corp.)
Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29455

Vol. 13, No. 12, P. 32

Ground-sensing circuit for arc-welding power supply prevents arc burns at loose ground connections on workpiece. Used with ac supply or dc supply of either polarity. Includes oscillator/detector pairs normally shorted out by ground connections to workpiece. When one or more of these four connections broken, one or more oscillator signals applied across power diodes and detected. Detected oscillator signal trips shutoff relay.

B90-10001

TESTER DETECTS STEADY-SHORT OR INTERMITTENT-OPEN CIRCUITS

BOBBY L. ANDERSON (Rockwell International Corp.)
Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29466

Vol. 14, No. 1, P. 18

Momentary open circuits or steady short circuits trigger buzzer. Simple, portable, lightweight testing circuit sounds long-duration alarm when it detects steady short circuit or momentary open circuit in coaxial cable or other two-conductor transmission line. Tester sensitive to discontinuities lasting 10 microseconds or longer. Used extensively for detecting intermittent open shorts in accelerometer and extensometer cables. Also used as ordinary buzzer-type continuity checker to detect steady short or open circuits.

B90-10002

ANOMALOUS POLARIZATION MAY IMPROVE INFRARED DETECTORS

CHAN-LON YANG (Caltech), and DEE-SON PAN (California State Univ., Los Angeles)
Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17450

Vol. 14, No. 1, P. 22

New configurations proposed for quantum-well devices. Simplifies alignment, increases sensitivity, and opens up more possibilities in design of quantum-well detectors of infrared radiation. In detector made according to proposed concept, light incident broadside on front surface absorbed. No special waveguide structures required.

B90-10003

CALCULATING SECOND-ORDER EFFECTS IN MOSFET'S

REUBEN BENUMOF (Caltech), JOHN A. ZOUTENDYK (Caltech), and JAMES R. COSS (Caltech)
Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17395

Vol. 14, No. 1, P. 22

Collection of mathematical models includes second-order effects in n-channel, enhancement-mode, metal-oxide-semiconductor field-effect transistors (MOSFET's). When dimensions of circuit elements relatively large, effects

neglected safely. However, as very-large-scale integration of microelectronic circuits leads to MOSFET's shorter or narrower than 2 micrometer, effects become significant in design and operation. Such computer programs as widely-used 'Simulation Program With Integrated Circuit Emphasis, Version 2' (SPICE 2) include many of these effects. In second-order models of n-channel, enhancement-mode MOSFET, first-order gate-depletion region diminished by triangular-cross-section deletions on end and augmented by circular-wedge-cross-section bulges on sides.

B90-10004

ASYMMETRIC MEMORY CIRCUIT WOULD RESIST SOFT ERRORS

MARTIN G. BUEHLER (Caltech), and MARVIN PERLMAN (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17394

Vol. 14, No. 1, P. 23

Some nonlinear error-correcting codes more efficient in presence of asymmetry. Combination of circuit-design and coding concepts expected to make integrated-circuit random-access memories more resistant to 'soft' errors (temporary bit errors, also called 'single-event upsets' due to ionizing radiation). Integrated circuit of new type made deliberately more susceptible to one kind of bit error than to other, and associated error-correcting code adapted to exploit this asymmetry in error probabilities.

B90-10005

WELDING-CURRENT INDICATOR

MILTON C. HENSLEY (Rockwell International Corp.), STEVEN W. HUSTON (Rockwell International Corp.), and RALPH E. KROY (Rockwell International Corp.)

Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29574

Vol. 14, No. 1, P. 24

Light flashes on to indicate high current. Simple, inexpensive display circuit indicates when 3,000-A welding current flows in welding gun. Onset of welding current induces voltage and current in 1,000-turn, 28-gauge copper-wire coil. Single-transistor amplifier amplifies induced current, energizing light-emitting diode (LED) connected to collector of transistor. Light from LED gives simple, direct indication of welding current.

B90-10045

PROGRAMMABLE ANALOG MEMORY RESISTORS FOR ELECTRONIC NEURAL NETWORKS

RAJESHUNI RAMESHAM (Caltech), SARITA THAKOOR (Caltech), TAHER DAUD (Caltech), and ANILKUMAR P. THAKOOR (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17398

Vol. 14, No. 2, P. 18

Electrical resistance of new solid-state device altered repeatedly by suitable control signals, yet remains at steady value when control signal removed. Resistance set at low value ('on' state), high value ('off' state), or at any convenient intermediate value and left there until new value desired. Circuits of this type particularly useful in nonvolatile, associative electronic memories based on models of neural networks. Such programmable analog memory resistors ideally suited as synaptic interconnects in 'self-learning' neural nets. Operation of device depends on electrochromic property of WO₃, which when pure is insulator. Potential uses include nonvolatile, erasable, electronically programmable read-only memories.

B90-10046**MECHANICALLY-STEERED, MOBILE SATELLITE-TRACKING ANTENNA**

D. J. BELL (Caltech), J. B. BERNER (Caltech), V. JAMNEJAD (Caltech), and K. E. WOO (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17607

Vol. 14, No. 2, P. 24

Signal from satellite tracked in moving vehicle. L-band, mechanically-steered, medium-gain antenna part of prototype radio equipment mounted in vehicle to demonstrate concept of land-mobile/satellite communication system. Provides such services as mobile telephone, voice or alphanumeric dispatch, paging, position-location information, and low-rate data transmission, for users within continental United States and Alaska. Antenna rotated mechanically until it finds direction from which maximum signal comes. Rate sensors provide inertial frame of reference during acquisition, so antenna locks onto signal even when vehicle turning.

B90-10047**PRINTED-CIRCUIT CROSS-SLOT ANTENNA**

WONG FOY (Teledyne Ryan Electronics), HSIEN-HSIEN CHUNG (Teledyne Ryan Electronics), and SHENG Y. PENG (Teledyne Ryan Electronics)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17706

Vol. 14, No. 2, P. 26

Coupling between perpendicular slots suppressed. Balanced feed configuration minimizes coupling between slots of printed-circuit cross-slot antenna unit. Unit and array have conventional cavity-backed-printed-circuit, crossed-slot antenna design. Strip-line feeders behind planar conductive antenna element deliver power to horizontal slot in opposite phase. As result, little or no power propagates into vertical slot. Similar considerations apply to strip lines that feed vertical slot. Units of this type elements of phased-array antennas for radar, mobile/satellite communications, and other applications requiring flush mounting and/or rapid steering of beams with circular polarization.

B90-10084**WIDEBAND MICROSTRIP ANTENNA-FEEDING ARRAY**

JOHN HUANG (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17548

Vol. 14, No. 3, P. 26

Special impedance-matching probes help reduce feed complexity. Lightweight array of microstrip antenna elements designed to transmit and illuminate reflector antenna with circularly polarized radiation at 1,545 to 1,550 MHz and to receive circularly polarized radiation at 1,646 to 1,660 MHz. Microstrip array is cluster of 7 subarrays containing total of 28 microstrip patches. Produces circularly polarized beam with suitable edge taper to illuminate reflector antenna. Teardrop-shaped feed probe provides gradual change of field from coaxial transmission line into microstrip substrate. Intended to be part of larger overlapping-cluster array generating multiple contiguous beams.

B90-10085**GE/SI INTEGRATED CIRCUIT FOR INFRARED IMAGING**

ROBERT W. FATHAUER (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17397

Vol. 14, No. 3, P. 28

Proposed integrated circuit consists of focal-plane array of metal/germanium Schottky-barrier photodetectors on same chip

with silicon-based circuits that processes signals from photodetectors. Made compatible with underlying silicon-based circuitry by growing germanium epitaxially on silicon circuit wafers. Metal deposited in ultrahigh vacuum immediately after growth of germanium. Combination of described techniques results in high-resolution infrared-imaging circuits of superior performance.

B90-10086**FIELD-INDUCED-GAP INFRARED DETECTORS**

C. THOMAS ELLIOTT (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17526

Vol. 14, No. 3, P. 32

Semimetals become semiconductors under applied magnetic fields. New detectors require less cooling equipment because they operate at temperatures higher than liquid-helium temperatures required by extrinsic-semiconductor detectors. Magnetic fields for detectors provided by electromagnets based on recently-discovered high-transition-temperature superconducting materials. Detector material has to be semiconductor, in which photon absorbed by exciting electron/hole pair across gap E_g of forbidden energies between valence and conduction energy bands. Magnetic- and compositional-tuning effects combined to obtain two-absorber detector having narrow passband. By variation of applied magnetic field, passband swept through spectrum of interest.

B90-10087**AN OPTIMAL DESIGN FOR STEERABLE DISH ANTENNA WITH BWG**

K. L. CHUANG (PRC Aerospace Technologies Division), and F. L. LANSING (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17429

Vol. 14, No. 3, P. 33

New design proposed for highly-efficient 34-m-diameter millimeter-wavelength antennas of NASA's Deep Space Network. Incorporates axial beam waveguide, BWG, and improved structure to maintain shape and alignment of reflecting surfaces. General approach to conceptual construction of structure to modularize overall system so critical constraint conditions pertaining to microwave optics and structural performance satisfied. Design retrofitted to existing NASA Deep Space Network 34-m antennas, or used as basis to build large ground-based steerable antennas. Engineering concepts involved in design adapted to design of other large, steerable antennas for telecommunications, radio astronomy, and military uses.

B90-10088**TUNABLE-QUANTUM-WELL INFRARED DETECTOR**

JOSEPH MASERJIAN (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17361

Vol. 14, No. 3, P. 34

Proposed detector of infrared photons based on photon-assisted, resonant quantum-mechanical tunneling between adjacent energy wells in its semiconductor structure. Wavelength adjusted by changing applied voltage. Device contains alternating layers of different semiconductors which form double-quantum-well electron-energy structure. Tunable-quantum-well detectors made on single chip constitutes line imager. Many such devices stacked to form two-dimensional imaging device. Signal-processing circuitry integrated into chip at its lower end. Potential barriers and wells produced by alternating layers of different semiconductor materials. Steepness of slope proportional to applied electric field. Electric field and thicknesses and heights of barriers selected to favor photon-assisted, resonant quantum-mechanical tunneling at chosen photon frequency.

B90-10089

GALLIUM ARSENIDE DOMINO CIRCUIT

LONG YANG (California Univ.), and STEPHEN I. LONG (California Univ.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17417

Vol. 14, No. 3, P. 36

Advantages include reduced power and high speed. Experimental gallium arsenide field-effect-transistor (FET) domino circuit replicated in large numbers for use in dynamic-logic systems. Name of circuit denotes mode of operation, which logic signals propagate from each stage to next when successive stages operated at slightly staggered clock cycles, in manner reminiscent of dominoes falling in a row. Building block of domino circuit includes input, inverter, and level-shifting substages. Combinational logic executed in input substage. During low half of clock cycle, result of logic operation transmitted to following stage.

B90-10090

32-GHZ WIDEBAND MASER AMPLIFIER

J. S. SHELL (Caltech), and D. E. NEFF (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17558

Vol. 14, No. 3, P. 38

High-gain, wideband, microwave amplifier based on ruby cooled by liquid helium. Features include low input equivalent noise temperature and 400-MHz bandwidth. Design basically extension of previous reflected-wave masers built for frequency range of 18 to 26 GHz. Maser amplifier includes eight stages connected in reflected-wave configuration. Particularly useful for detection of weak microwave signals in radio astronomy and communications.

B90-10091

EPOXIES BOND WAVEGUIDES TO FLANGES

JAY D. BLOOM (Harris Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17497

Vol. 14, No. 3, P. 40

Each waveguide/flange joint made with conductive adhesive and structural adhesive. New two-adhesive joints overcome many of disadvantages of dip-brazed joints, including damage caused by heat of brazing process, corrosion of joints by brazing salts retained in them, cracks in joints, weakening of waveguide material and limitation to use of aluminum alloys, which are only ones dip-brazed. Flange machined slightly oversize and beveled to accommodate structural and conductive adhesives.

B90-10140

HEADER FOR LASER DIODE

JONATHAN A. R. RALL, and PAUL L. SPADIN

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13234

Vol. 14, No. 4, P. 16

Header designed to contain laser diode. Output combined incoherently with outputs of other laser diodes in grating laser-beam combiner in optical communication system. Provides electrical connections to laser diode, cooling to thermally stabilize laser operation, and optomechanical adjustments that steer and focus laser beam. Range of adjustments provides for correction of worst-case decentering and defocusing of laser beam encountered with laser diodes. Mechanical configuration made simple to promote stability and keep cost low.

B90-10141

QUANTIZED-'GRAY-SCALE' ELECTRONIC SYNAPSES

JAMES L. LAMB (Caltech), TAHER DAUD (Caltech), and ANILKUMAR P. THAKOOR (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17579

Vol. 14, No. 4, P. 21

Proposed array of programmable synaptic connections for electronic neural network applications offers multiple quantized levels of connection strength using only simple, two-terminal, binary microswitch devices. Subgrids in fine grid of programmable resistive connections connected externally in parallel to form coarser synaptic grid. By selection of pattern of connections in each subgrid, connection strength of synaptic node represented by that subgrid set at quantized 'gray level'. Device structures promise implementations of quantized-'gray-scale' synaptic arrays with very high density.

B90-10142

DURABLE BIPOLAR PLATES FOR LEAD/ACID BATTERIES

THOMAS J. CLOUGH (ENSCI, Inc.), and NAUM PINSKY (ENSCI, Inc.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17662

Vol. 14, No. 4, P. 22

New structure for positive faces of bipolar plates increases longevity of lead/acid batteries. Divides positive-electrode layer into many isolated segments so defects cannot spread across layer. Surfaces treated before assembly to promote adhesion. Ridges on body divide possible electrode into isolated squares, each typically 1 in. on side. Materials supporting electrochemically active components lightweight and resistant to acid.

B90-10143

INTERFEROMETRIC FIBER-OPTIC GYROSCOPE

RAMON P. DEPAULA (Caltech), GAIL A. BOGERT (AT&T Bell Laboratories), and WILLIAM J. MINFORD (AT&T Bell Laboratories)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17515

Vol. 14, No. 4, P. 22

Integrated three-waveguide directional coupler functions as polarizer and splitter. Designed with transverse electric (TE) polarization in bar state (two coupling lengths) and transverse magnetic (TM) polarization in cross state (one coupling length). Intended for eventual fabrication as in mass-producible integrated optical circuit that provides advantages including low drive voltage, large-bandwidth phase modulation, preservation of polarization in transmission between devices on same substrate, and low cost.

B90-10144

UPPER-BOUND ESTIMATES OF SEU IN CMOS

LARRY D. EDMONDS (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17566

Vol. 14, No. 4, P. 26

Theory of single-event upsets (SEU) (changes in logic state caused by energetic charged subatomic particles) in complementary metal oxide/semiconductor (CMOS) logic devices extended to provide upper-bound estimates of rates of SEU when limited experimental information available and configuration and dimensions of SEU-sensitive regions of devices unknown. Based partly on chord-length-distribution method.

B90-10145**FORWARD BIAS INHIBITS SINGLE-EVENT UPSETS**

JOHN A. ZOUTENDYK (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17573**Vol. 14, No. 4, P. 28**

Bipolar integrated circuits more resistant to ionizing radiation. Tests show resistance of bipolar integrated logic or memory circuit by single-event upsets increased by imparting forward bias to diode constituted by buried layer of substrate and collector.

B90-10146**EXACT CHORD-LENGTH DISTRIBUTION FOR SEU CALCULATIONS**

MARTIN G. BUEHLER (Caltech), and KEUNG L. LUKE (California State Univ.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17657**Vol. 14, No. 4, P. 30**

Computed rates of SEU's more accurate. Exact integral chord-length distribution derived for use in calculations of rates of single-event upsets (SEU's) (changes in logic states) caused by impingement of cosmic rays or other ionizing radiation on electronic logic circuits.

B90-10147**CRYSTAL OSCILLATORS OPERATE BEYOND RATED FREQUENCIES**

LEONARD L. KLEINBERG

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13171**Vol. 14, No. 4, P. 30**

Amplifiers with single-pole frequency responses used in their 'roll-off' regions. Class of crystal oscillators based on use of negative-voltage-gain amplifiers at frequencies well into 'roll-off' frequency regions of their gain-versus-frequency curves. Defining characteristic helps keep costs of oscillators low; not necessary to use more expensive amplifiers that have flat frequency responses out to desired operating frequencies. Enables amplifier to produce phase shift necessary for oscillation, reducing cost further by eliminating need for some of passive components in oscillators of more conventional design.

B90-10148**THERMAL-INTERACTION MATRIX FOR RESISTIVE TEST STRUCTURE**

MARTIN G. BUEHLER (Caltech), JAIPAL K. DHIMAN (Caltech), and NASSER ZAMANI (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17673**Vol. 14, No. 4, P. 32**

Linear mathematical model predicts increase in temperature in each segment of 15-segment resistive structure used to test electromigration. Assumption of linearity based on fact: equations that govern flow of heat are linear and coefficients in equations (heat conductivities and capacities) depend only weakly on temperature and considered constant over limited range of temperature.

B90-10199**SUPERLATTICE LONG-WAVELENGTH INFRARED SENSORS**

ROBERT W. FATHAUER (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-17713**Vol. 14, No. 5, P. 18**

Superlattice of LaN and Si detects at wavelengths up to 12 micrometers. If LaN grown epitaxially on silicon, sensitivity of silicon-based photodetectors extended farther into infrared wavelength region with high quantum detection efficiency by use of LaN/Si superlattices. In principle, by appropriate choice of thicknesses of layers, effective band-gap energy of superlattice structure set to any desired value between band gaps of two materials.

B90-10200**NONVOLATILE IONIC TWO-TERMINAL MEMORY DEVICE**

ROGER M. WILLIAMS (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17621**Vol. 14, No. 5, P. 20**

Conceptual solid-state memory device nonvolatile and erasable and has only two terminals. Proposed device based on two effects: thermal phase transition and reversible intercalation of ions. Transfer of sodium ions between source of ions and electrical switching element increases or decreases electrical conductance of element, turning switch 'on' or 'off'. Used in digital computers and neural-network computers. In neural networks, many small, densely packed switches function as erasable, nonvolatile synaptic elements.

B90-10201**RECOVERING ENERGY FROM A RAPIDLY SWITCHED GATE**

WALLY E. RIPPEL (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17221**Vol. 14, No. 5, P. 20**

Circuit proposed to recover energy usually lost in charging and discharging internal gate capacitance of field-effect transistor during high-frequency switching. Scheme includes pulse-forming circuit generating rectangular waveform with zero-level notches near beginning and end of 'on' period. Inductor resonates internal gate capacitance so energy recovered during notches.

B90-10202**IMPROVED THERMAL-SWITCH DISKS PROTECT BATTERIES**

ERIC DARCY, and BOBBY BRAGG

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21428**Vol. 14, No. 5, P. 24**

Improved thermal-switch disks help protect electrical batteries against high currents like those due to short circuits or high demands for power in circuits supplied by batteries. Protects batteries against excessive temperatures. Centered by insulating fiberglass washer. Contains conductive polymer that undergoes abrupt increase in electrical resistance when excessive current raises its temperature above specific point. After cooling, polymer reverts to low resistance. Disks reusable.

B90-10203**INTEGRATED ELECTRO-OPTICAL LASER-BEAM SCANNERS**

WARREN T. BOORD (APA Optics, Inc.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21498**Vol. 14, No. 5, P. 26**

Scanners using solid-state devices compact, consume little power, and have no moving parts. Integrated electro-optical laser scanner, in conjunction with external lens, points outgoing beam of light in any number of different directions, depending on number

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of upper electrodes. Offers beam-deflection angles larger than those of acousto-optic scanners. Proposed for such diverse applications as nonimpact laser printing, color imaging, ranging, barcode reading, and robotic vision.

B90-10204

OPTOELECTRONIC INTEGRATED CIRCUITS FOR NEURAL NETWORKS

D. PSALTIS (Caltech), J. KATZ (Caltech), JAE-HOON KIM (Caltech), S. H. LIN (Caltech), and A. NOUHI (Caltech)
May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17652

Vol. 14, No. 5, P. 28

Many threshold devices placed on single substrate. Integrated circuits containing optoelectronic threshold elements developed for use as planar arrays of artificial neurons in research on neural-network computers. Mounted with volume holograms recorded in photorefractive crystals serving as dense arrays of variable interconnections between neurons.

B90-10205

CHEAP CORNER REFLECTORS FOR RADAR

E. R. CARO (Caltech), and L. J. OLIVIERI (Caltech)
May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17658

Vol. 14, No. 5, P. 30

Corner reflectors for radar constructed easily and inexpensively. Wire mesh on plastic pipe forms retroreflective panels of triangular or square shape. Panels joined by bolts and wingnuts. Overlapping panel edges ensure mutual perpendicularity. Materials for new reflectors found in hardware and building-supply stores. No special skills or tools needed for assembly.

B90-10206

OPTICALLY-TUNED FAR-INFRARED DEVICE

JOSEPH KATZ (Caltech)
May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17160

Vol. 14, No. 5, P. 30

Spacing of visible interference pattern determines frequency of infrared radiation. Variable photoconductivity grating formed by interference of two visible laser beams intersecting on surface of proposed AlGaAs device substituted for fixed metal grating. Proposed device provides higher output-power density and greater tunability.

B90-10207

LAYERED INTERNAL-PHOTOEMISSION SENSOR

ROBERT W. FATHAUER (Caltech)
May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17751

Vol. 14, No. 5, P. 32

High quantum efficiency achieved without multiple layer contacts. Proposed infrared sensor based on photoemission from multiple layers of metal silicide sandwiched between layers of silicon. Suitable for use in focal-plane arrays. Layered internal-photoemission sensor has positive/intrinsic/negative structure modified by inclusion of layers or islands of metal silicide. Holes photo-excited from silicide regions and swept to detection by reverse-bias electric field in intrinsic silicon. Easier to make because internal layers allowed to 'float' electrically, contact being made with only two outer semiconductor layers.

B90-10208

MAKING MORE EFFICIENT USE OF BATTERY-PLATE MASS

JOHN J. ROWLETTE (Caltech)
May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17435

Vol. 14, No. 5, P. 34

Improved active material for positive plate of lead/acid electric storage battery made with additional porosity to give electrolyte access to larger plate-surface area. 65 to 68 percent of active mass of plate used to generate electric current. Batteries with new plate material offer extremely long cycle life.

B90-10255

NITRIC OXIDE ENHANCES CHARGE-COUPLED DEVICE

MICHAEL H. HECHT (Caltech), and EDWARD H. POINDEXTER (Army Electronics Technology and Development Lab.)
Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17281

Vol. 14, No. 6, P. 26

Simple treatment increases and stabilizes quantum efficiency of charge-coupled-device photodetector illuminated on back surface at wavelengths less than 4,500 Angstrom. Must be biased in strong accumulation mode. Physical principle of enhancement explained more fully in 'Metal Film Increases CCD Output' (NPO-16815). Useful for imaging at wavelengths from ultraviolet to blue; for example, in astronomical observations.

B90-10256

IRIDIUM FILM FOR CHARGE-COUPLED DEVICE

MICHAEL H. HECHT (Caltech)
Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17327

Vol. 14, No. 6, P. 26

Usability extended to different environments. Application of thin film of iridium to back surface of back-surface-illuminated charge-coupled device expected to increase and stabilize quantum efficiency at wavelengths less than 4,500 Angstrom. Enhances quantum efficiency according to principle discussed in 'Metal Film Increases CCD Output' (NPO-16815). Does not react with hydrogen, so device need not be kept in oxygen. Advantage where high absorption of ultraviolet light by oxygen undesirable; for example, when device used to make astronomical observations from high altitudes.

B90-10257

SILICIDE SCHOTTKY BARRIER FOR BACK-SURFACE-ILLUMINATED CCD

MICHAEL H. HECHT (Caltech)
Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17328

Vol. 14, No. 6, P. 26

Quantum efficiency of back-surface-illuminated charge-coupled device (CCD) increased by coating back surface with thin layer of PtSi or IrSi on thin layer of SiO₂. In its interaction with positively-doped bulk Si of CCD, silicide/oxide layer forms Schottky barrier that repels electrons, promoting accumulation of photogenerated charge carriers in front-side CCD potential wells. Physical principle responsible for improvement explained in 'Metal Film Increases CCD Output' (NPO-16815).

B90-10258

MOBILE CENTERS FOR SECONDARY POWER DISTRIBUTION

ROBERT L. MEARS (McDonnell-Douglas Corp.)
Jun. 1990 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11410

Vol. 14, No. 6, P. 28

Concept for distribution of 60-Hz ac power in large building devoted to assembly and testing of equipment improves safety, reduces number of outlets and lengthy cables, and readily accommodates frequent changes in operations and configuration. Power from floor recess fed via unobtrusive cable to portable power management center. A cart containing variety of outlets and circuit breakers, wheeled to convenient location near equipment to be assembled or tested. Power distribution system presents larger range of operational configurations than fixed location. Meets tighter standards to feed computers and delicate instruments. Industrial-grade power suitable for power tools and other hardware. Three-phase and single-phase outlets available from each.

B90-10259

ANALOG DELTA-BACK-PROPAGATION NEURAL-NETWORK CIRCUITRY

SILVIO EBERHART (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17564

Vol. 14, No. 6, P. 28

Changes in synapse weights due to circuit drifts suppressed. Proposed fully parallel analog version of electronic neural-network processor based on delta-back-propagation algorithm. Processor able to 'learn' when provided with suitable combinations of inputs and enforced outputs. Includes programmable resistive memory elements (corresponding to synapses), conductances (synapse weights) adjusted during learning. Buffer amplifiers, summing circuits, and sample-and-hold circuits arranged in layers of electronic neurons in accordance with delta-back-propagation algorithm.

B90-10260

CONTROL CIRCUIT FOR TWO STEPPING MOTORS

ROGER RATLIFF, KENNETH REHMANN, and CHARLES BACKUS

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13202

Vol. 14, No. 6, P. 30

Control circuit operates two independent stepping motors, one at a time. Provides following operating features: After selected motor stepped to chosen position, power turned off to reduce dissipation; Includes two up/down counters that remember at which one of eight steps each motor set. For selected motor, step indicated by illumination of one of eight light-emitting diodes (LED's) in ring; Selected motor advanced one step at time or repeatedly at rate controlled; Motor current - 30 mA at 90 degree positions, 60 mA at 45 degree positions - indicated by high or low intensity of LED that serves as motor-current monitor; Power-on reset feature provides trouble-free starts; To maintain synchronism between control circuit and motors, stepping of counters inhibited when motor power turned off.

B90-10261

MOBILE UNINTERRUPTIBLE POWER SUPPLY

ROBERT L. MEARS (McDonnell-Douglas Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11409

Vol. 14, No. 6, P. 34

Proposed mobile unit provides 20 kVA of uninterruptible power. Used with mobile secondary power-distribution centers to provide power to test equipment with minimal cabling, hazards, and obstacles. Wheeled close to test equipment and system being tested so only short cable connections needed. Quickly moved

and set up in new location. Uninterruptible power supply intended for tests which data lost or equipment damaged during even transient power failure.

B90-10262

PHASE-COMPENSATING SYSTEM FOR FIBER-OPTIC HOLOGRAPHY

CAROLYN R. MERCER, and GLENN BEHEIM

Jun. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-26641) 'Active Phase Compensation System for Fiber Optic Holography'

LEW-14864

Vol. 14, No. 6, P. 34

Phase-compensating system controls relative phase of laser light emitted from two optical fibers. Stabilized for conventional holographic applications, or stepped through sequence of 90 degree phase shifts for phase-stepping holographic interferometry. Closed-loop system compensates for phase fluctuations caused by mechanical stresses and temperature changes in fibers, providing long-term phase stability and phase steps accurate to within 0.02 degrees. Controls environmental fluctuations in phases of light emitted by output fibers.

B90-10313

GTO/FET CASCODE THREE-TERMINAL SWITCH

WALLY E. RIPPEL (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17865

Vol. 14, No. 7, P. 18

Neither external bias nor energy-storage components required. Three-terminal semiconductor switching circuit features high switching speed, extremely high turnoff safe operating area (area in current-vs-voltage plane), moderately low forward ('on'-state) voltage drop, and efficient utilization of silicon in design of components. Includes gate-turn-off thyristor (GTO) and low-voltage (low-on-resistance) field-effect transistor (FET-1) connected in series to form cascode pair. Made of commercially available, discrete components, as hybrid circuit package or as monolithic integrated circuit.

B90-10314

POROUS-FLOATING-GATE FIELD-EFFECT TRANSISTOR

ANILKUMAR P. THAKOOR (Caltech), ALEXANDER W. MOOPENN (Caltech), and JOHN J. LAMBE (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17532

Vol. 14, No. 7, P. 18

Porous-floating-gate, 'vertical' field-effect transistor proposed as programmable analog memory device especially suitable for use in electronic neural networks. Analog value of electrical conductance of device represents synaptic weight (strength of synaptic connection) repeatedly modified by application of suitable writing or erasing voltage. Suited for hardware implementations of massively parallel neural-network architectures for two important reasons: vertical transistor structure requires only two external electrodes, and use of tailored amorphous semiconductors provides choice of very wide range of low conductivity values, dictated by overall power dissipation requirements in massively parallel neural-network circuits.

B90-10315

SWITCHING X-RAY TUBES REMOTELY

RONALD V. BULTHUIS (Rockwell International Corp.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29357

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Convenient switch and relay circuit reduces risk of accidents. Proposed switching circuit for x-ray inspection system enables operator to change electrical connections to x-ray tubes remotely. Operator simply flips switch on conveniently-located selector box to change x-ray heads. Indicator lights on selector box show whether 160 or 320-kV head connected. Relays in changeover box provides proper voltages and coolants. Chance of making wrong connections and damaging equipment eliminated.

B90-10316

GAAIAS TRAVELING-WAVE ELECTRO-OPTICAL MODULATORS

KUL B. BHASIN, CHRISTOPHER M. CHOREY (Case Western Reserve Univ.), and ALTAN FERENDECI (Case Western Reserve Univ.)

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-28240) A High Frequency GaAlAs Traveling Wave Electro-optic Modulator at 0.82 micrometers.

LEW-14866

Vol. 14, No. 7, P. 24

Microwave signals modulate optical signals in unit integrable with GaAs and GaAlAs devices. Experimental GaAlAs electro-optical modulators designed and built for operation at wavelength of 0.82 micrometers. Easily integrable with GaAs monolithic microwave integrated circuits. Integrated optical and microwave waveguides in electro-optical materials constitute traveling-wave electro-optical modulator in configuration of Mach-Zehnder interferometer. Because characteristic impedance of waveguide 50 ohms - standard value - no impedance-matching network required.

B90-10317

TUNABLE QUANTUM-WELL SUBMILLIMETER-WAVE OSCILLATORS

JOSEPH MASERJIAN (Caltech), and ARTHUR C. GOSSARD (California Univ.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17754

Vol. 14, No. 7, P. 26

Tunable submillimeter-wave generator is layered (Al/Ga)As device. Frequencies adjusted via applied voltages. New device concept offers potential to make relatively compact, efficient local oscillators for heterodyne mixers in submillimeter radar and imaging systems, nondestructive testing, diagnosis of plasmas, airborne spectroscopy of atmosphere, detection of weapons and other contraband, and communications.

B90-10318

CIRCUIT REGULATES SPEED OF DC MOTOR

CHARLES WEAVER (SRI International Corp.), ROBIN PADDEN (SRI International Corp.), and FLOYD A. BROWN, JR. (SRI International Corp.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21345

Vol. 14, No. 7, P. 28

Driving circuit regulates speed of small dc permanent-magnet motor in tape recorder. Two nested feedback loops maintain speed within 1 percent of constant value. Inner loop provides coarse regulation, while outer loop removes most of variation in speed that remains in the presence of regulation by the inner loop. Compares speed of motor with commanded speed and adjusts current supplied to motor accordingly.

B90-10319

AIAS DIFFUSION/SCHOTTKY BARRIER ON GAAS

WILLIAM J. KAISER (Caltech), FRANK J. GRUNTHANER (Caltech),

L. DOUGLAS BELL (Caltech), and MICHAEL H. HECHT (Caltech) Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17796

Vol. 14, No. 7, P. 30

Ultrathin epitaxial film of AIAs deposited on GaAs substrate to serve as Schottky barrier and/or as barrier to diffusion. Deposited without interrupting processing vacuum in which substrate deposited and in which any subsequent layers deposited. In new technique, epitaxial film of AIAs deposited directly on GaAs substrate to depth of only two atomic layers - less than 1 nanometer thick. Film thin enough so it does not constitute electronic barrier, but thick enough to act as barrier to interdiffusion of gold and GaAs. Film also used as barrier to interdiffusion of dopants at heterojunctions.

B90-10320

HIGH-VOLTAGE DIGITAL-TO-ANALOG CONVERTER

STEVEN W. HUSTON (Rockwell International Corp.)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29605

Vol. 14, No. 7, P. 32

High-voltage 10-bit digital-to-analog converter operates under computer control to put out voltages up to 500 V at currents up to 35 mA. Circuit includes high-voltage power supply used to generate high-voltage square wave at frequency set by computer at value between 0.2 Hz and 10 Hz. Used to drive 0.02-microfarad, 1-kV capacitor at slewing rate of 1 V/microsecond to provide signal for robotic imaging system.

B90-10321

SMALL, LIGHTWEIGHT WELDING-CURRENT INDICATOR

STEVEN W. HUSTON (Rockwell International Corp.)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29622

Vol. 14, No. 7, P. 32

Welding-current indicator made of surface-mounted components on flexible circuit board. Holds variety of components on surface. After assembly, flexible circuit wrapped to fit around transformer core. Surface-mounted devices make it unnecessary to drill holes in circuit board to accommodate component leads. Use of small surface-mounted devices result in lightweight, compact indicator circuit.

B90-10322

MULTIPLE-DYNODE-LAYER MICROCHANNEL PLATE

BRUCE E. WOODGATE

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13203

Vol. 14, No. 7, P. 33

Improved microchannel-plate electron image amplifier made of stack of discrete microchannel-plate layers. New plates easier to manufacture because no need to etch long, narrow holes, to draw and bundle thin glass tubes, or to shear plates to give microchannels curvatures necessary for reduction of undesired emission of ions. Discrete dynode layers stacked with slight offset from layer to layer to form microchannel plate with curved channels. Provides for relatively fast recharging of microchannel dynodes, with consequent enhancement of performance.

B90-10323

SPECTROSCOPIC ANALYSIS OF INSULATING CRYSTAL FIBERS

A.M. BUONCRISTIANI (Christopher Newport College), ADDISON T. INGE, and C.E. BYVIK

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

LAR-13831**Vol. 14, No. 7, P. 34**

New method provides rapid characterization of optical properties. Technique for determining optical properties of insulating single-crystal fibers developed and applied to sapphire, spinel, and YAlO crystalline host fibers doped with triply ionized titanium. Crystal fibers grown more rapidly and less expensively.

B90-10378**AUTOMATIC RANGE CHANGER FOR SWR METER**

ROBERT J. DENGLER (Caltech), and PETER H. SIEGEL (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17822**Vol. 14, No. 8, P. 18**

Commercial unit modified for antenna-pattern measurements. Addition of automatic range-changing circuit converts Hewlett-Packard 415E standing-wave-ratio (SWR) meter into radio-frequency detector suitable for computer-controlled measurements of radiation patterns of antennas. Modification gives SWR meter effective dynamic range of at least 40 dB. Includes two digital lines communicating one of four range settings to controlling computer and one digital line to inhibit transfer of data when range being changed. Ideal instrument for use in applications involving computer-controlled monitoring of power when large changes in signal level expected.

B90-10379**SELF-ALIGNED GUARD RINGS FOR SCHOTTKY-BARRIER DIODES**

TRUE-LON LIN (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17734**Vol. 14, No. 8, P. 20**

Proposed self-aligned guard ring increases active area of Schottky-barrier infrared detector. Concept developed for silicide Schottky-barrier diodes in which platinum silicide or iridium silicide Schottky-contacts provide cutoff wavelengths of about 6 or 10 micrometers. Grid of silicon dioxide doped with phosphorus etched on silicon wafer, and phosphorus from grid diffused into substrate, creating n-type guard rings. Silicide layers formed in open areas of grid. Overlap of guard rings and silicide layers small.

B90-10380**STARTING CIRCUIT FOR ERASABLE PROGRAMMABLE LOGIC DEVICE**

STEVEN W. COLE (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17827**Vol. 14, No. 8, P. 20**

Voltage regulator bypassed to supply starting current. Starting or 'pullup' circuit supplies large inrush of current required by erasable programmable logic device (EPLD) while being turned on. Operates only during such intervals of high demand for current and has little effect any other time. Performs needed bypass, acting as current-dependent shunt connecting battery or other source of power more nearly directly to EPLD. Input capacitor of regulator removed when starting circuit installed, reducing probability of damage to transistor in event of short circuit in or across load.

B90-10381**MULTI-PINNED-PHASE CHARGE-COUPLED DEVICE**

JAMES R. JANESICK (Caltech)

Aug. 1990 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17462**Vol. 14, No. 8, P. 22**

Multi-pinned-phase (MPP) technology allows charge-coupled device (CCD) to operate totally inverted during both integration and readout while maintaining other performance characteristics. MPP-CCD made with positive doping implants defining barrier phases. When all phases biased together into inversion, dark current reduced, and potential of charge-collecting wells is difference between potentials of barrier and collection phases. Advantages include complete elimination of residual image effects during integration and readout, low pixel nonuniformity, and increase in quantum efficiency in near infrared because higher operating temperatures used. More tolerant to ionizing radiation environments.

B90-10382**IMAGING ANTENNA STRUCTURE FOR SUBMILLIMETER WAVELENGTHS**

G. REBEIZ (Caltech), and D. RUTLEDGE (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17799**Vol. 14, No. 8, P. 24**

Integrated-circuit antenna structure contains two-dimensional array of antennas and antenna reflectors. In receiving mode, each antenna acts as part of detector for one picture element in millimeter- or submillimeter-wavelength imaging radar system. Millimeter-wave imaging system used to view objects through fog, smoke, or smog with resolution intermediate between microwave and visible-light imaging systems. Antenna elements, supports, and reflectors made by integrated-circuit techniques. Structures fabricated on front and back substrates separately. Substrates then joined. Inexpensive way to provide large number of small antenna elements required for imaging, all mounted rigidly in way that does not degrade operation.

B90-10383**MONOLITHIC OPTOELECTRONIC INTEGRATED CIRCUIT**

KUL B. BHASIN, WAYNE WALTERS (Honeywell, Inc.), JERRY GUSTAFSEN (Honeywell, Inc.), and MARK BENDETT (Honeywell, Inc.)

Aug. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14922**Vol. 14, No. 8, P. 25**

Monolithic optoelectronic integrated circuit (OEIC) receives single digitally modulated input light signal via optical fiber and converts it into 16-channel electrical output signal. Potentially useful in any system in which digital data must be transmitted serially at high rates, then decoded into and used in parallel format at destination. Applications include transmission and decoding of control signals to phase shifters in phased-array antennas and also communication of data between computers and peripheral equipment in local-area networks.

B90-10384**IMPROVED PHOTOVOLTAIC-DRIVEN QUANTUM LIGHT MODULATOR**

JOSEPH MASERJIAN (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17357**Vol. 14, No. 8, P. 26**

Additional features increase sensitivity and utility. Modifications proposed to improve device described in 'Photovoltaic-Driven Multiple-Quantum-Well Modulator' (NPO-16914) and 'Strain-Layer-Superlattice Light Modulator' (NPO-16915). Resembles prior devices of this general type but includes active region using quantum state filling and more optimum structure. Exploits quantum well equivalent of Moss-Burnstein shift.

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B90-10385

TEST PROCESSOR FOR PCM TELEMETRY

DAVID MASSEY, and BRIAN CORBIN

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13291

Vol. 14, No. 8, P. 27

User displays telemetric data in variety of formats. TDPlus system is a data-processing subsystem designed for use in testing pulse-code-modulation (PCM) telemetry equipment. Accommodates variety of PCM formats. Includes custom-built set of four circuit cards that plug into any personal computer compatible with Industry Standard Architecture (ISA) bus. Software written in 'C', very user-friendly, and enables anyone who has basic knowledge of telemetry to use system without instruction manual. Built for about tenth of cost of currently available commercial unit of similar capability.

B90-10386

COPPER CHLORIDE CATHODE FOR LIQUID-SODIUM CELL

RATNAKUMAR V. BUGGA (Caltech), SALVADOR DISTEFANO (Caltech), GANESAN NAGASUBRAMANIAN (Caltech), and CLYDE P. BANKSTON (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17640

Vol. 14, No. 8, P. 28

Rechargeable liquid-sodium cell with copper chloride cathode offers substantial increase in energy density over cells made with other cathode materials. Unit has theoretical maximum energy density of 1135 W.h/kg. Generates electricity by electrochemical reaction of molten sodium and solid copper chloride immersed in molten electrolyte, sodium tetrachloroaluminate at temperature of equal to or greater than 200 degrees C. Wall of alumina tube separates molten electrolyte from molten sodium anode. Copper chloride cathode embedded in pores of sintered nickel cylinder or directly sintered.

B90-10387

ELECTRO-OPTICAL PROBING OF TERAHERTZ INTEGRATED CIRCUITS

K. B. BHASIN, R. ROMANOFSKY, J. F. WHITAKER (Michigan Univ.), J. A. VALDMANIS (Michigan Univ.), G. MOUROU (Michigan Univ.), and T. A. JACKSON (Rochester Univ.)

Aug. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-21142) External Electro-optic Probing Of Millimeter-Wave Integrated Circuits.

LEW-14956

Vol. 14, No. 8, P. 29

Electro-optical probe developed to perform noncontact, nondestructive, and relatively noninvasive measurements of electric fields over broad spectrum at millimeter and shorter wavelengths in integrated circuits. Manipulated with conventional integrated-circuit-wafer-probing equipment and operated without any special preparation of integrated circuits. Tip of probe small electro-optical crystal serving as proximity electric-field sensor.

B90-10388

FAILURES OF CMOS CIRCUITS IRRADIATED AT LOW RATES

CHARLES A. GOBEN (Caltech), and WILLIAM E. PRICE (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17867

Vol. 14, No. 8, P. 29

Report describes experiments on irradiation of SGS 4007 complementary metal oxide/semiconductor (CMOS) integrated inverter circuits by ⁶⁰Co and ¹³⁷Cs radioactive sources. Purpose of experiments to supplement previous observations that minimum radiation doses at which failure occurred in more-complicated CMOS parts were lower at lower dose rates.

B90-10436

VIEWING INTEGRATED-CIRCUIT INTERCONNECTIONS BY SEM

RUSSEL A. LAWTON (Caltech), ROBERT E. GAULDIN (Caltech), and RONALD P. RUIZ (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17635

Vol. 14, No. 9, P. 18

Back-scattering of energetic electrons reveals hidden metal layers. Experiment shows that with suitable operating adjustments, scanning electron microscopy (SEM) used to look for defects in aluminum interconnections in integrated circuits. Enables monitoring, in situ, of changes in defects caused by changes in temperature. Gives truer picture of defects, as etching can change stress field of metal-and-passivation pattern, causing changes in defects.

B90-10437

PLANAR MICROSTRIP YAGI ANTENNAS

JOHN HUANG (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17873

Vol. 14, No. 9, P. 18

Developmental class of antennas based on combination of microstrip-patch and Yagi-array concepts. Mutual coupling between microstrip elements, ordinarily considered nuisance, used to advantage. Applicable to both linearly and circularly polarized antennas. Use of fewer driven elements results in less complexity and reduced loss of power in associated transmission lines and other coupling and power-distributing circuitry. Applications include antennas on land vehicles, television receiving antennas, and conformal antennas on aircraft.

B90-10438

SWITCHING MATRIX FOR OPTICAL SIGNALS

CHARLES H. GROVE

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11392

Vol. 14, No. 9, P. 22

Proposed matrix of electronically controlled shutters switches signals in optical fibers between multiple input and output channels. Size, weight, and power consumption reduced. Device serves as building block for small, low-power, broad-band television- and data-signal-switching systems providing high isolation between nominally disconnected channels.

B90-10439

DIELECTRIC-FILLED PARABOLOIDAL FRONT ENDS

PETER H. SIEGEL (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17802

Vol. 14, No. 9, P. 24

Planar antennas with receiving and/or transmitting circuits integrated at focal point. Reflectors formed from shaped dielectric material with metallized parabolic surface serve as basis for wide variety of planar, integrated receiver and transmitter circuits operating at millimeter and submillimeter wavelengths. Used over wide range of frequencies and in variety of modes: as receiver or transmitter, in heterodyne or direct-detection mode, with single element, or with array.

B90-10440

MCT/MOSFET SWITCH

WALLY E. RIPPEL (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-18001

Vol. 14, No. 9, P. 26

Metal-oxide/semiconductor-controlled thyristor (MCT) and metal-oxide/semiconductor field-effect transistor (MOSFET) connected in switching circuit to obtain better performance. Offers high utilization of silicon, low forward voltage drop during 'on' period of operating cycle, fast turnon and turnoff, and large turnoff safe operating area. Includes ability to operate at high temperatures, high static blocking voltage, and ease of drive.

B90-10441

MILLIMETER-WAVE QUANTUM-WELL FREQUENCY MULTIPLIERS

PAUL D. BATELAAN (Caltech), and MARGARET A. FRERKING (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17584

Vol. 14, No. 9, P. 28

Double-barrier quantum-well GaAs diode achieved 0.61 percent efficiency as frequency tripler when operated at input frequency of 63.7 GHz, nearly one-tenth cutoff frequency of diode. Efficiency increased with drive level up to maximum input power available, 40 mW. Diodes studied for use in local-oscillator chains in microwave radiometers. Potential applications include spectrometers and radar.

B90-10442

HIGH-EFFICIENCY KLYSTRON FOR TELEVISION TRANSMITTERS

PETER RAMINS, JAMES DAYTON, EARL MCCUNE, SR. (Varian Associates), and HENRY KOSMAHL (Analex Corp.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14926

Vol. 14, No. 9, P. 30

Improved klystron designed for use as final amplifier in ultrahigh-frequency (UHF) television transmitter. New device incorporates multistage depressed collector (MSDC) of advanced design to increase efficiency by recovering, from spent electron beam, some of residual kinetic energy otherwise dissipated as heat. Concept applied to increase efficiencies of microwave communication, equipment, radar systems, and particle-beam accelerators.

B90-10443

EFFECTS OF DOSE RATES ON RADIATION DAMAGE IN CMOS PARTS

CHARLES A. GOBEN (Caltech), JAMES R. COSS (Caltech), and WILLIAM E. PRICE (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17344

Vol. 14, No. 9, P. 32

Report describes measurements of effects of ionizing-radiation dose rate on consequent damage to complementary metal oxide/semiconductor (CMOS) electronic devices. Depending on irradiation time and degree of annealing, survivability of devices in outer space, or after explosion of nuclear weapons, enhanced. Annealing involving recovery beyond pre-irradiation conditions (rebound) detrimental. Damage more severe at lower dose rates.

B90-10444

MORE ABOUT LENS ANTENNA FOR MOBILE/SATELLITE COMMUNICATION

Y. RAHMAT-SAMII (Caltech), D. G. BODNAR (Georgia Inst of

Tech), and B. K. RAINER (Georgia Inst of Tech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17680

Vol. 14, No. 9, P. 33

Report presents additional details of design of proposed phased-array antenna described in 'Lens Antenna for Mobile/Satellite Communication' (NPO-16948). Intended to be compact and to lie flat on top of vehicle on ground. Transmits and receives circularly polarized radiation in frequency ranges of 821 to 825 MHz and 860 to 870 MHz. Transmitting and receiving beams electronically steerable to any of 48 evenly spaced directions to provide complete azimuth coverage, and would be fixed, but wide, in elevation, to provide coverage at elevation angles from 20 degrees to 60 degrees.

B90-10445

DIRECTIONAL COUPLERS FOR DETECTING CIRCULAR WAVEGUIDE MODES

DANIEL J. HOPPE (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17175

Vol. 14, No. 9, P. 33

Samples of TE₁₁ and TE₁₂ modes coupled selectively out of circular waveguide. Report presents additional details of theory, construction, and measured operating characteristics of directional couplers described in 'Microwave Transmitter With Multimode Output Section' (NPO-16826). Couplers consist of tapered rectangular-cross-section waveguides fastened lengthwise to outside of circular waveguide, with uniformly-lengthwise-spaced round coupling holes between each rectangular waveguide and circular waveguide.

B90-10464

COMPUTING SCATTERING MATRICES FOR CIRCULAR WAVEGUIDES

DANIEL J. HOPPE (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17245

Vol. 14, No. 9, P. 65

Scattering Matrix Program for Circular Waveguide Junctions computes scattering matrix for series of circular waveguide sections. Sections must have same axis, but radius and length of each section completely arbitrary. Devices analyzed include simple waveguide step discontinuity like that used in a dual-mode horn, stepped matching section, or corrugated waveguide section with constant or varying slot depth. Certain types of corrugated horns also analyzed with program. Mathematical model used in program accurately predicts reflection and transmission characteristics of such devices, taking into account excitation of modes of higher order as well as multiple reflections and energy stored at each discontinuity. Written in FORTRAN 77.

B90-10465

DIFFRACTION ANALYSIS OF DISTORTED REFLECTOR ANTENNAS

YAHYA RAHMAT-SAMII (Caltech), and JEFFREY H. MUMFORD (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16818

Vol. 14, No. 9, P. 66

Effects of systematic distortions of surfaces on radiation patterns predicted. Computer program for Diffraction Analysis of Reflector Antennas Subject to Systematic Distortions predicts performance of reflector antennas subject to sinusoidal, thermal, or gravitational distortions. Provides local interpolation algorithm

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readily applied to nonregular distribution of data. Developed in UNIVAC FORTRAN 77 for UNIVAC computer.

B90-10504

ANNULAR-BRAGG-GRATING SURFACE-EMITTING LASER

ROBERT J. LANG (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17912

Vol. 14, No. 10, P. 20

Proposed semiconductor laser emits radiation perpendicularly to its broad surface by use of annular Bragg grating as output coupler. Produces narrow output beam. Advantages include lower threshold current, smaller size, and increased efficiency.

B90-10505

UNSTABLE-RESONATOR DISTRIBUTED-BRAGG-REFLECTOR LASER

ROBERT J. LANG (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17906

Vol. 14, No. 10, P. 20

Proposed distributed-Bragg-reflector (DBR) semiconductor laser has wide curved gratings favoring single-mode operation, even with relatively wide laser stripe, enabling use of higher power. Consists of semiconductor double heterostructure laser bounded at each end by region of passive waveguide.

B90-10506

ANTIREDUCTION INSULATOR FOR SOLID-ELECTROLYTE CELL

PAUL J. SHLICHTA (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17211

Vol. 14, No. 10, P. 24

Depletion of oxygen from electrolyte prevented. Proposed to add layer of electrical insulation between solid electrolyte and portion of porous negative electrode under negative metal contact in solid-electrolyte cell. Helps maintain efficiency of cell by preventing 'shadow' effect degrading portion of electrolyte under negative contact and sometimes near seals.

B90-10507

BINARY OPERATION OF A LIQUID-CRYSTAL LIGHT VALVE

JEFFREY A. DAVIS (San Diego State Univ. Foundation)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17614

Vol. 14, No. 10, P. 24

Conditions for operation of commercially available liquid-crystal light valve as binary spatial light modulator discovered. In mode, modulator turns on sharply and then saturates as intensity of writing beam increases. Valve comprises photoconductive layer and liquid-crystal layer separated by dielectric mirror and sandwiched between two transparent electrodes. Potential applications include enhancement of images, optical recording, and holography.

B90-10508

HIGH-VOLTAGE SQUARE-WAVE GENERATOR

MARK T. BERNIUS (Caltech), and ARA CHUTJIAN (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17772

Vol. 14, No. 10, P. 26

Fast switching circuit puts out rectangular pulses of order of kilovolt or greater at typical repetition frequencies as high as

hundreds of kilohertz and with rise times as short as 50 ns. Designed around power metal oxide/semiconductor field-effect transistors (MOSFET's). Optically isolated power MOSFET's in series rapidly switch output between high voltages $V(\text{sub } 1)$ and $V(\text{sub } 2)$. Used to supply power to pulsed laser or to modulate beam of charged particles in laboratory experiment or industrial process.

B90-10509

CURRENT-MONITORING AND -LIMITING CIRCUIT FOR 28-VDC SUPPLY

G. ERNEST RODRIGUEZ

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13310

Vol. 14, No. 10, P. 28

Current-monitoring and -limiting circuit protects 28-Vdc power supply against steady overload. Provides some protection against sudden peak currents. Acts as limiter, monitoring amplifier, and delayed-action circuit breaker. Consists of pair of power metal oxide/semiconductor field-effect transistors (MOSFET's).

B90-10510

LOW-INDUCTANCE WIRING FOR PARALLEL SWITCHING TRANSISTORS

M. S. VEATCH (Martin Marietta Corp.), and D. M. LANDIS (Martin Marietta Corp.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28387

Vol. 14, No. 10, P. 30

Simple configuration for wiring of multiple parallel-connected switching transistors minimizes stray wiring inductance while providing for use of balancing transformers, which equalize currents in transistors. Currents balanced on twisted pairs of wires. Because twisted pairs carry both 'hot-side' and return currents, this configuration has relatively low inductance.

B90-10511

TWO-WAY OPTICAL DATA LINK ON ONE FIBER

HAROLD KIRKHAM (Caltech), ALAN R. JOHNSTON (Caltech), SHANNON P. JACKSON (Caltech), and HEATHER A. FRIEND (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17884

Vol. 14, No. 10, P. 31

Optoelectronic terminal for digital communication both transmits and receives over single optical fiber. Uses same semiconductor device - light-emitting diode (LED) - as both transmitting and receiving transducer. Dual-purpose LED's reduce cost.

B90-10563

EXTERNAL Peltier COOLER FOR LOW-NOISE AMPLIFIER

TERRY A. SOPER (Lockheed Engineering and Management Services Co., Inc.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21422

Vol. 14, No. 11, P. 26

Inexpensive Peltier-effect cooling module made of few commercially available parts used to reduce thermal noise in microwave amplifier. Retrofitted to almost any microwave low-noise amplifier or receiver preamplifier used in communication, telemetry, or radar. Includes copper or aluminum cold plate held tightly against unit to be cooled by strap-type worm-gear clamps.

B90-10564

VOLTAGE-BOOSTING DRIVER FOR SWITCHING REGULATOR

RONALD C. TRUMP (Honeywell, Inc.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28437

Vol. 14, No. 11, P. 26

Driver circuit assures availability of 10- to 15-V gate-to-source voltage needed to turn on n-channel metal oxide/semiconductor field-effect transistor (MOSFET) acting as switch in switching voltage regulator. Includes voltage-boosting circuit efficiently providing gate voltage 10 to 15 V above supply voltage. Contains no exotic parts and does not require additional power supply. Consists of NAND gate and dual voltage booster operating in conjunction with pulse-width modulator part of regulator.

B90-10565

FAILURES OF CMOS DEVICES AT LOW RADIATION-DOSE RATES

CHARLES A. GOBEN (Caltech), and WILLIAM E. PRICE (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17868

Vol. 14, No. 11, P. 30

Method for obtaining approximate failure-versus-dose-rate curves derived from experiments on failures of SGS 4007 complementary metal oxide/semiconductor (CMOS) integrated circuits irradiated by Co60 and Cs137 radioactive sources.

B90-10566

MULTI-QUANTUM-WELL SPATIAL LIGHT MODULATORS ON SI SUBSTRATES

JAMES A. CUTTS (Caltech), JOSEPH KATZ (Caltech), and PHILIP J. DUMONT (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17651

Vol. 14, No. 11, P. 32

Proposed new class of two-dimensional spatial light modulators (SLM's) based on fabrication of multi-quantum-well (MQW) structures (e.g. of AlGaAs and InGaAs) on silicon substrates. Concept makes two-dimensional SLM arrays by taking advantage of mature technology of silicon charge-coupled devices (CCD's). Features include short response times, high resolution, and low switching energies.

B90-10567

PREVENTING SIMULTANEOUS CONDUCTION IN SWITCHING TRANSISTORS

WILLIAM T. MCLYMAN (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17775

Vol. 14, No. 11, P. 34

High voltage spikes and electromagnetic interference suppressed. Power-supply circuit including two switching transistors easily modified to prevent simultaneous conduction by both transistors during switching intervals. Diode connected between collector of each transistor and driving circuit for opposite transistor suppresses driving signal to transistor being turned on until transistor being turned off ceases to carry current.

B90-10568

RAIN-BLOWING PLENUM FOR ANTENNA FEED HORN

PETER S. HAMES (Planning Research Corp.), and SCOTT R. STEWART (Planning Research Corp.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17493

Vol. 14, No. 11, P. 36

Double-diaphragm radome drives raindrops away from antenna feed horn. Includes solid diaphragm at mouth of feed horn surmounted by perforated diaphragm. Pressurized air in plenum between diaphragms flows out through perforations. Eliminates increase in noise temperature occurring when water covers radome. Useful for X-band and higher frequencies, susceptible to effects of water.

B90-10569

SEGMENTED COIL FAILS IN STEPS

RONALD S. STEDMAN (Rockwell International Corp.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21574

Vol. 14, No. 11, P. 36

Electromagnetic coil degrades in steps when faults occur, continues to operate at reduced level instead of failing catastrophically. Made in segments connected in series and separated by electrically insulating barriers. Fault does not damage adjacent components or create hazard. Used to control valves in such critical applications as cooling systems of power generators and chemical process equipment, where flammable liquids or gases handled. Also adapts to electrical control of motors.

B90-10619

IMPROVED VOICE-COIL ACTUATORS HAVE LOWER COPPER LOSSES

SATORU SIMIZU (Advanced Materials Corp.), FAIZ POURARIAN (Advanced Materials Corp.), EDWIN B. BOLTICH (Advanced Materials Corp.), and SURYANARAYAN G. SANKAR (Advanced Materials Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26111

Vol. 14, No. 12, P. 18

Improved design concept for electromagnetic linear-motion actuators of loudspeaker-voice-coil type reduces both copper losses (dissipation of power in electrical resistances of windings) and magnetic interference with other equipment. Includes closed magnetic circuit, which suppresses fringing flux. Pr/Fe/B permanent magnets yield better performance at lower temperatures. Intended for use where power supplies limited, heating must be minimized, and/or adequate performance at temperatures far below ambient required.

B90-10620

CHARGING/SAFETY-INTERLOCK CONNECTION FOR CAPACITOR BANK

WALLY E. RIPPEL (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17519

Vol. 14, No. 12, P. 20

Electrically controlled mechanical interlock apparatus prevents connection of bank of capacitors to battery or other dc power supply until capacitors precharged to nearly full supply voltage. Precharge eliminates excessive inrush current, which damages capacitors, wires, or connectors. Circuit in apparatus also discharges capacitors after power turned off or capacitors disconnected from power supply.

02 ELECTRONIC SYSTEMS

B86-10016
IN-FLIGHT SIMULATOR FOR IFR TRAINING

L. C. PARKER

Jun. 1986

KSC-11218 Vol. 10, No. 1, P. 56

Computer-controlled unit feeds navigation signals to airplane instruments. Electronic training system allows students to learn to fly according to instrument flight rules (IFR) in uncrowded airspace. New system self-contained IFR simulator carried aboard training plane. Generates signals and commands for standard instruments on airplane, including navigational receiver, distance-measuring equipment, automatic direction finder, a marker-beacon receiver, altimeter, airspeed indicator, and heading indicator.

B86-10017
TIMED MULTIPLE-LASER ARRAY

J. B. LAUDENSLAGER (Caltech), and T. J. PACALA (Caltech)

Jun. 1986

NPO-16433 Vol. 10, No. 1, P. 58

Pulse power, frequency, and shape variable and combined to suit particular applications. Versatile laser system combines high power with high efficiency, long life, and low cost. System consists of array of excimer lasers fired under microcomputer control. When fired in unison, array produces high-power pulse at higher efficiency than otherwise possible. When fired in sequence, array produces pulses at a high rate without unduly stressing components and shortening their lives.

B86-10018
DETECTOR ARRAYS WITH IMAGE-PLANE PROCESSING

D. J. JOBSON

Jun. 1986 See Also (N84-25927)

LAR-13391 Vol. 10, No. 1, P. 60

Image detection and edge processing merged on same VLSI chip. Concept combines relatively large detector with small processor elements as VLSI chip features and has many specific embodiments. New device concept retains relatively large detector element sizes (perhaps 10 to 100 micrometers or larger in diameter) with processing-electronics components of much smaller size (2 micrometers or less), filling in gaps left between detectorelement active areas. Detector-array device helps to perform difference-of-Gaussian operation for use in machine-vision edge enhancement and edge detection.

B86-10019
ECONOMICAL VIDEO MONITORING OF TRAFFIC

B. C. HOUSER (Caltech), G. PAINE (Caltech), L. D. RUBENSTEIN (Caltech), O. BRUCE PARHAM, JR. (Caltech), W. GRAVES (Dalmo Victor, Textron), and C. BRADLEY (MDOT)

Jun. 1986

NPO-16473 Vol. 10, No. 1, P. 61

Data compression allows video signals to be transmitted economically on telephone circuits. Telephone lines transmit television signals to remote traffic-control center. Lines also carry command signals from center to TV camera and compressor at highway site. Video system with television cameras positioned at critical points on highways allows traffic controllers to determine visually, almost immediately, exact cause of traffic-flow disruption; e.g., accidents, breakdowns, or spills, almost immediately. Controllers can then dispatch appropriate emergency services and alert motorists to minimize traffic backups.

B86-10020
INTEGRATED-CIRCUIT ACTIVE DIGITAL FILTER

R. NATHAN (Caltech)

Jun. 1986

NPO-16020 Vol. 10, No. 1, P. 62

Pipeline architecture with parallel multipliers and adders speeds calculation of weighted sums. Picture-element values and partial sums flow through delay-adder modules. After each cycle or time unit of calculation, each value in filter moves one position right. Digital integrated-circuit chips with pipeline architecture rapidly move 35 X 35 two-dimensional convolutions. Need for such circuits in image enhancement, data filtering, correlation, pattern extraction, and synthetic-aperture-radar image processing: all require repeated calculations of weighted sums of values from images or two-dimensional arrays of data.

B86-10021
INTERMEDIATE-FREQUENCY-TO-VIDEO-BAND CONVERTER

N. C. HAM (Caltech), V. M. CHAVEZ (Caltech), V. S. CHEN (Caltech), and T. SATO (Caltech)

Jun. 1986

NPO-16214 Vol. 10, No. 1, P. 64

Analog and digital circuits combined to frequency-convert from intermediate frequencies directly to video-band frequencies to meet stringent requirements. IF-to-video-band converter operates on principle of signal-band cancellation in phase-quadrature circuits. Downconverts intermediate frequencies directly to video-band frequencies to near-zero frequency with good image-band rejection and low phase variation within passband.

B86-10022
HARDWARE/SOFTWARE EXPANSION OF DISPLAY TERMINAL AND CPU

B. R. ADAMS (Kentron International, Inc.)

Jun. 1986

LAR-13350 Vol. 10, No. 1, P. 65

IBM PC coupling used to expand capabilities of expensive specialpurpose system. IBM PC was interfaced to Tektronix CP1151 computer through teletype port of Tektronix 4010-1 computer display terminal. Electronic interface built to provide isolation, level shifting, and signal inversion between IBM PC RS-232 port and 4010-1 terminal teletype port. Modifications to 4010-1 terminal made to increase teletype rate from 110 to 9,600 baud. Software for both computers developed to give control of DPO system to IBM PC and provide data/program file exchange between two computers. Coupling demonstrates utilization of low-cost microcomputer hardware and software to expand capabilities of expensive special-purpose computer systems.

B86-10023
PSEUDOLOG DIGITAL-TO-ANALOG CONVERTER

S. T. GOODER

Jun. 1986

LEW-14219 Vol. 10, No. 1, P. 65

Sensitivity decreases by 10 at beginning of each input decade. Method conceived to convert binary-coded data to suitable linear form for stripchart recording. Strip-chart recordings obtained from typical pressure readings in a vacuum system during pumpdown. In reading curve, BCD digital vacuum-gage output processed by analog-to-digital converter in such way that only reading digits (but not range) appear in output. In range and reading, range also converted to analog and placed as most significant digit.

B86-10024
MICROWAVE SENSOR MEASURES TURBOPUMP SPEED

J. M. MARAM (Rockwell International Corp.), and L. WYETT (Rockwell International Corp.)

Jun. 1986

MFS-28083**Vol. 10, No. 1, P. 67**

Sensor does not perturb flow and immune to cavitation. Reflected microwave signal is amplitude-modulated by passing reflective facets of nut on rotating shaft. Modulation frequency measured to find rotational speed. Device measures rotational speed of turbopump without obstructing flow.

B86-10025**SIMULATING SINGLE-EVENT UPSETS IN BIPOLAR RAM'S**

J. A. ZOUTENDYK (Caltech)

Jun. 1986

NPO-16491**Vol. 10, No. 1, P. 67**

Simulation technique saves testing. Uses interactive version of SPICE (Simulation Program with Integrated Circuit Emphasis). Device and subcircuit models available in software used to construct macromodel for an integrated bipolar transistor. Time-dependent current generators placed inside transistor macromodel to simulate charge collection from ion track. Significant finding of experiments is standard design practice of reducing power in unaddressed bipolar RAM cell increases sensitivity of cell to single-event upsets.

B86-10026**PLASMA SOURCE FOR CHARGE CONTROL**

G. ASTON (Caltech), L. C. PLESS (Caltech), and W. D. DEININGER (Caltech)

Jun. 1986

NPO-16576**Vol. 10, No. 1, P. 68**

Plasma source neutralizes electrical charge on spacecraft. When triggered by command from spacecraft potential monitor or from control system, plasma apparatus responds within about 1 s, generating charged plasma of required polarity. Discharging system to be tested on Air Force Geophysics Laboratory BERT-1 (Beam Emission Rocket Test) sounding rocket.

B86-10027**SINGLE-EVENT UPSETS CAUSED BY HIGH-ENERGY PROTONS**

W. E. PRICE (Caltech), D. K. NICHOLS (Caltech), L. S. SMITH (Caltech), and G. A. SOLI (Caltech)

Jun. 1986

NPO-16504**Vol. 10, No. 1, P. 68**

Heavy secondary ions do not significantly alter device responses. Conclusion that external reaction products cause no significant alteration of single-event-upset response based on comparison of data obtained from both lidded and unlidded devices and for proton beams impinging at angles ranging from 0 degrees to 180 degrees with respect to chip face. Study also found single-event-upset cross section increases only modestly as proton energy increased to 590 MeV, characteristic of maximum energies expected in belts of trapped protons surrounding Earth and Jupiter.

B86-10028**HYPERSPECTRAL INFRARED IMAGES OF TERRAIN**

G. VANE (Caltech), A. F. H. GOETZ (Caltech), J. B. WELLMAN (Caltech), and C. C. LABAW (Caltech)

Jun. 1986

NPO-16295**Vol. 10, No. 1, P. 69**

Images at 128 wavelengths allow direct identification of many earth surface materials. Two reports describe advanced airborne spectrometer that creates images of terrain at many wavelengths. Airborne imaging spectrometer (AIS) produces two-dimensional images in 128 spectral bands in 1.2-to-2.4-micrometer wavelength region. Images created by 32-by-32 array of mercury cadmium telluride detector elements. Array views swath of Earth below moving aircraft. Used for agricultural, geological, and other surveys.

B86-10109**DIGITAL SIGNAL COMBINING FOR CONFERENCE CALLING**

F. BYRNE

May 1986

KSC-11285**Vol. 10, No. 2, P. 50**

Signals combined with minimal noise by use of sums in read-only memories. Signals from subscribers A and B digitized, transmitted, and combined by addressing ROM. Combining operation electronic equivalent of looking up value of function of two variables in mathematical table. Combined digitized signal transmitted, converted to analog form, and delivered to subscriber C. System intended especially for combining number of separate audio signals into one signal for retransmission, as in telephone conference calling.

B86-10110**FAST INITIALIZATION OF BUBBLE-MEMORY SYSTEMS**

K. T. LOONEY, C. D. NICHOLS, and P. J. HAYES

May 1986 See Also (N84-27977)

LAR-13357**Vol. 10, No. 2, P. 52**

Improved scheme several orders of magnitude faster than normal initialization scheme. State-of-the-art commercial bubble-memory device used. Hardware interface designed connects controlling microprocessor to bubble-memory circuitry. System software written to exercise various functions of bubble-memory system in comparison made between normal and fast techniques. Future implementations of approach utilize E2PROM (electrically-erasable programmable read-only memory) to provide greater system flexibility. Fastinitialization technique applicable to all bubble-memory devices.

B86-10111**BLENDING GYRO SIGNALS TO IMPROVE CONTROL STABILITY**

J. F. L. LEE (Honeywell, Inc.)

May 1986

MSC-20370**Vol. 10, No. 2, P. 55**

Interference by structural vibrations reduced by adding signals from spatially separated gyros. Technique involves blending signals from rate gyroscopes located at different parts of structure to obtain composite signal that more nearly represents rotation of entire structure. Aircraft vibrations perpendicular to pitch axis contribute to rotations sensed by pitch-rate gyros. Proper blending of signals from gyros suppress contribution of dominant vibrational mode. Most likely applications of concept are flight-control systems for aircraft.

B86-10112**SYNCHRONIZATION OF DATA RECORDED ON DIFFERENT RECORDERS**

J. H. WISE (Caltech), and J. W. MCGREGOR (Caltech)

May 1986

NPO-16555**Vol. 10, No. 2, P. 56**

Electrical and mechanical timing errors corrected. Electronic timing system enables time correlation of analog and digital signals recorded on different magnetic tapes or on different tracks of same tape. Recorded simultaneously on different magnetic-tape tracks along with data signals to enable subsequent time correlation of data. Concept improves analysis of Space Shuttle flight-data tapes containing signals with frequency components up to 50 Hz, used for higher frequencies, in kilohertz region. Useful in other applications requiring synchronization of data on different data tracks.

B86-10113**WIND-TUNNEL-MODEL LEAK-CHECKING SYSTEM**

W. E. LARSON

May 1986 See Also (N85-17936)

02 ELECTRONIC SYSTEMS

LAR-13449 Vol. 10, No. 2, P. 58

Voice-actuated system allows one operator to do work of three. System uses voice-recognition-and-response unit and graphics terminal to interact with technician and to provide technician visual feedback. Computer-based Leakcheck system allows computer to do more of total work in checking model for leaks to reduce time and manpower required to perform task.

B86-10114 **LASER RANGING SYSTEM**

J. K. RUSSELL (Lockheed Corp.)

May 1986

MSC-20870 Vol. 10, No. 2, P. 59

Laser system points and focuses TV camera. Ranger is modified stock distance-measuring unit mounted on and electrically connected to television camera. Effective over target range of 3 to 500 ft. (approximately 1 to 150m). Developed for television monitoring of nearby objects from Space Shuttle. Super-imposes range and range-rate (speed of approach or recession) data on television image of target. Principle adaptable to applications such as proximity warning and robot control.

B86-10115 **SWITCHED-MULTIBEAM ANTENNA SYSTEM**

R. S. IWASAKI (Axiomatix)

May 1986

MSC-20873 Vol. 10, No. 2, P. 60

Various time delays introduced at intermediate frequency aim antenna in different directions. System includes spherical reflector with feed horn containing two five-element cross arrays. Each element in cross array connected to different set of switched delay lines. Antenna has low and moderate gains and wide coverage.

B86-10116 **TV VIDEO-LEVEL CONTROLLER**

M. KRAVITZ (RCA Corp.), L. A. FREEDMAN (RCA Corp.), E. H. FREDD (RCA Corp.), and D. E. DENEFF (RCA Corp.)

May 1986

MSC-18578 Vol. 10, No. 2, P. 62

Constant output maintained, though luminance varies by 5 million to 1. Three means of normalizing video output utilized in video-level controller: iris adjustment, tube voltage adjustment, and automatic gain control. With aid of automatic light control and gain control, television camera accommodates maximum light level 5 million times greater than lowest light level, while outputting constant 3-V peak signal to processing circuitry.

B86-10117 **SIMULATION OF PCM DATA**

G. G. BERNSTROM (IBM Corp.)

May 1986

KSC-11239 Vol. 10, No. 2, P. 63

Program for communications and control computer simulates pulse-code-modulated data. Software for simulation pulse-code-modulated (PCM) data from Space Shuttle during launch preparations developed for use with checkout, control, and monitor subsystem (CCMS). Facilitates testing of CCMS with data expected from main engines, external fuel tanks, operational instrumentation, general-purpose computer, backup flight system, and payload. Simulator program executes in standard CCMS hardware, requiring no new hardware.

B86-10209 **ADJUSTABLE WORK STATION FOR VIDEO DISPLAYS AND KEYBOARDS**

F. ROE, NICHOLAS SHIELD, JR. (Essex Corp.), M. F. FAGG (Essex Corp.), and D. HENDERSON (Essex Corp.)

May 1986

MFS-26009 Vol. 10, No. 3, P. 44

Work station for video displays and keyboards adaptable to operational and anthropometric requirements of individual operators. Visual displays placed beyond keyboard and in line with inclination of keyboard to minimize operator's head movement. In addition, station arranged so operator's eyes and hands focus onto three primary control and display areas. Quickens operating response and decreases chance of error, since input devices and feedback to operator are collocated.

B86-10210 **ANALOG VIDEO IMAGE-ENHANCING DEVICE**

L. M. WEINSTEIN

May 1986

LAR-13336 Vol. 10, No. 3, P. 46

Inexpensive system yields pseudo-three-dimensional effect. Includes video camera with lens, connected to video monitor for analog video enhancement. Video signal obtained from monitor at point beyond where synchronization signals are detected, eliminating need to regenerate composite video signal. Analog video image-enhancing device improves appearance of technical photographs by selectively compressing overall dynamic ranges while accentuating edges or small details of greatest interest.

B86-10211 **AUTOMATED SIGNAL-TO-NOISE RATIO MEASUREMENT**

J. E. PINEDA (Lockheed Engineering and Management Services Co., Inc.)

May 1986

MSC-21021 Vol. 10, No. 3, P. 48

Computer-controlled spectrum analysis gives rapid results for communication systems. Locates carrier signal in intermediate-frequency band and measures both carrier amplitude and amplitude of noise in several channels near carrier frequency. Computer then computes ratio of signal to average noise. Because measurements and calculations are rapid, system used in fading communication channels.

B86-10212 **PHASE-MEASURING SYSTEM**

W. T. DAVIS

May 1986

LAR-13439 Vol. 10, No. 3, P. 49

System developed and used at Langley Research Center measures phase between two signals of same frequency or between two signals, one of which is harmonic multiple of other. Simple and inexpensive device combines digital and analog components to give accurate phase measurements. One signal at frequency f fed to pulse shaper, produces negative pulse at time t_4 . Pulse applied to control input of sample-and-hold module 1. Second signal, at frequency nf , fed to zero-crossover amplifier, producing square wave at time t . Signal drives first one-shot producing narrow negative pulse at t_1 . Signal then drives second one-shot producing narrow positive pulse at time t_2 . This pulse used to turn on solid-state switch and reset integrator circuit to zero.

B86-10213 **WIRELESS 'JUMP' STARTS FOR PARTLY DISABLED EQUIPMENT**

K. D. CASTLE

May 1986

MSC-21010 Vol. 10, No. 3, P. 49

Equipment activated when normal remote starting does not work. Beam from nearby station first carries raw energy and then subsystem-activating signals to equipment crippled by discharged storage batteries. Operators start up equipment without

approaching it under hazardous conditions. Potential terrestrial applications for scheme include starting of robots on such remotely-controlled hazardous tasks as handling of explosives or retrieval or deposition of objects in hostile environments.

B86-10214**RADIATION HARDENING OF COMPUTERS**

D. K. NICHOLS, L. S. SMITH, J. A. ZOUTENDYK, A. E. GIDDINGS (Sandia National Laboratories), F. W. HEWLETT (Sandia National Laboratories), and R. K. TREECE (Sandia National Laboratories)

May 1986

NPO-16767

Vol. 10, No. 3, P. 50

Single-event upsets reduced by use of oversize transistors. Computers made less susceptible to ionizing radiation by replacing bipolar integrated circuits with properly designed, complementary metaloxide-semiconductor (CMOS) circuits. CMOS circuit chips made highly resistant to single-event upset (SEU), especially when certain feedback resistors are incorporated. Redesign chips also consume less power than original chips.

B86-10215**LASER INERTIAL NAVIGATION SYSTEM**

R. J. HRUBY, G. XENAKIS, R. A. CARESTIA (University of Southern Colorado), W. S. BJORKMAN (Analytical Mechanics Associates, Inc.), S. F. SCHMIT (Analytical Mechanics Associates, Inc.), and L. D. CORLISS (U.S. Army Aeromechanics Laboratory)

May 1986

ARC-11473

Vol. 10, No. 3, P. 53

Acceptable accuracy obtained with short alignment time. Report describes successful helicopter tests of laser inertial navigational equipment. Tests conducted over 3-year period, both in laboratory and flight. Inertial system used as position/velocity/attitude indicator and later also served as part of automatic flight-control system.

B86-10233**ECONOMIC-ANALYSIS PROGRAM FOR A COMMUNICATION SYSTEM**

R. G. CHAMBERLAIN

May 1986

NPO-16606

Vol. 10, No. 3, P. 74

Prices and profits of alternative designs compared. Objective of Land Mobile Satellite Service Finance Report (LMSS) program is to provide means for comparing alternative designs of LMSS systems. Program is Multiplan worksheet program. Labels used in worksheet chosen for satellite-based cellular communication service, but analysis not restricted to such cases. LMSS written for interactive execution with Multiplan (version 1.2) and implemented on IBM PC series computer operating under DOS (version 2.11).

B86-10317**PILOT-TONE SYSTEM FOR MOBILE COMMUNICATIONS**

F. DAVARIAN (Caltech)

Jul. 1986

NPO-16414

Vol. 10, No. 4, P. 46

In mobile communication system called tone-calibrated technique, pilot tone provides phase- and amplitude-calibration reference to enable coherent demodulation of signal at receiver despite fading. Signal received by or from mobile terminal faded due to motion of terminal and propagation of signal along multiple paths. Fading introduces random amplitude modulation and phase modulation with bandwidth of twice Doppler frequency shift. Degrading effects of multipath fading reduced. Tonecalibrated technique for use with phase-modulated data or telephony systems using Manchester digital pulse-code modulation.

B86-10318**REDUCED-BANDWIDTH CODING FOR MOBILE COMMUNICATION**

F. DAVARIAN (Caltech)

Jul. 1986

NPO-16447

Vol. 10, No. 4, P. 48

Fade-resistant mobile systems use power and spectrum efficiently. Transmission system employs tone-calibrated technique (TCT). Residual carrier used in technique to reduce fading-induced effects and coherently demodulate received signal. TCT potentially efficient in use of power and of frequency spectrum. Coding technique, intended for residual-carrier transmission system, alleviates fading and spectrum crowding that hamper mobile communications.

B86-10319**FRAME-SYNCHRONIZATION-ASSISTING MODULE**

C. DESILVEIRA (Caltech)

Jul. 1986

NPO-16564

Vol. 10, No. 4, P. 51

Auxiliary data processor does computations related to synchronization of frames of telemetry data, relieving main processor of task. Called frame-synchronization-assisting module (FSAM), sorts through large amounts of data to determine whether valid and how configured. Module connected to main processor of computer through direct-memory-access (interface) module. Examines data in computer memory to find frame-synchronizing codes.

B86-10320**MOTOR SERVOLOOP WITH OPTICAL SHAFT ENCODER**

S. P. MARASCALCO (Sperry Rand Corp.)

Jul. 1986

ARC-11582

Vol. 10, No. 4, P. 52

Position and rate feedback signals derived from single transducer. Servoloop generates digital and analog shaft-position and analog shaft-speed signals from output of incremental optical encoder. Signals used in feedback control of motor.

B86-10321**DIGITAL PSEUDONOISE GENERATOR**

A. KNOEBEL (Caltech)

Jul. 1986

NPO-16627

Vol. 10, No. 4, P. 53

Architecture developed for noise generator based on pseudorandom number sequence. Concept involves no additions or multiplications; outputs of set of feedback shift registers combined, bit-by-bit, in accordance with desired probability distribution. Digital, pseudorandom number output fed to digital-to-analog converter to generate pseudonoise signal suitable for testing broadband amplifiers.

B86-10322**COMPENSATING FUNCTION FOR ANTENNA POINTING**

D. L. MINGORI (University of California, Los Angeles), and J. S. GIBSON (University of California, Los Angeles)

Jul. 1986

NPO-16616

Vol. 10, No. 4, P. 54

Mean-square errors of antenna surface reduced. Compensating function helps point deformable antenna without inducing excessive pointing oscillations or deformations of reflecting surface. When implemented on computer in real time, function enables calculation of control signals in response to several sensor inputs: Function devised so signals control torque actuator of antenna-pointing mechanism in way to reduce or minimize squares of errors of antenna surface over long time.

02 ELECTRONIC SYSTEMS

B86-10323

AIRBORNE INSTRUMENTATION COMPUTER SYSTEM

G. A. BEVER

Jul. 1986 See Also N84-20521/NSP

ARC-11602

Vol. 10, No. 4, P. 56

Modular microcomputer provides real-time data processing and telemetry/interface functions. Programmable instrumentation system links pulse-code-modulation (PCM) telemetry to digital systems on test aircraft. Called AICS for airborne instrumentation computer system, also analyzes flight-test data during flight. Synthesized voice output available.

B86-10324

VLSI ARCHITECTURES FOR COMPUTING DFT'S

T. K. TRUONG (Caltech), J. J. CHANG (Caltech), I. S. HSU (Caltech), I. S. REED (Caltech), and D. Y. PEI (Caltech)

Jul. 1986

NPO-16656

Vol. 10, No. 4, P. 58

Simplifications result from use of residue Fermat number systems. System of finite arithmetic over residue Fermat number systems enables calculation of discrete Fourier transform (DFT) of series of complex numbers with reduced number of multiplications. Computer architectures based on approach suitable for design of very-large-scale integrated (VLSI) circuits for computing DFT's. General approach not limited to DFT's; Applicable to decoding of error-correcting codes and other transform calculations. System readily implemented in VLSI.

B86-10335

COMPUTER PROGRAM FOR SPACE-SHUTTLE TESTING

M. D. HYMAN (Abacus Programming Corp.), G. H. FINE (Abacus Programming Corp.), and G. J. HOLLOMBE (Abacus Programming Corp.)

Jul. 1986

MSC-20779

Vol. 10, No. 4, P. 70

Demand on Space Shuttle general-purpose computers reduced. Simulations Testbed and Scenario Pre-processor (STB&SPP) system reduces need for use of GPC's in hardware and software development and testing. System consists of computer program, SPP, and set of utility subroutines, STB, which incorporates Interface Simulator (ISIM). STB&SPP system written in FORTRAN V and Assembler.

B86-10420

SWITCHING SYSTEM FOR REDUNDANT POWER SUPPLIES

M. BRADFORD (United Technologies), R. GRANT (United Technologies), and G. PARKINSON (United Technologies)

Sep. 1986

ARC-11545

Vol. 10, No. 5, P. 46

Load-transfer unit connects airborne computer to standby power supply in case primary supply fails. Concept adaptable to systems in which power interruptions cannot be tolerated; for example, computers with volatile memories, safety equipment, and precise timers. Load-transfer unit monitors voltages and load current. Microprocessor controls transistor switches that connect load to whichever power supply has highest priority and correct voltage.

B86-10421

FADE-FREE MOBILE COMMUNICATION

C. R. STEVENSON (Caltech)

Sep. 1986

NPO-16441

Vol. 10, No. 5, P. 48

Scheme for mobile communication reduces multipath fading and interference between adjacent channels. Proposed communication system lends itself to almost completely digital implementation, eliminating costly and bulky crystal filters. Scheme suitable for satellite-aided or terrestrial mobile communication,

including cellular mobile telephony, at frequencies in 150-to-900-MHz range.

B86-10422

MONOLITHIC 20-GHZ TRANSMITTING MODULE

T. KASCAK, G. KAELIN (Rockwell International Corp.), and A. GUPTA (Rockwell International Corp.)

Sep. 1986 See Also N84-13399/NSP

LEW-14285

Vol. 10, No. 5, P. 51

20-GHz monolithic microwave/millimeter-wave integrated circuit (MMIC) with amplification and phase-shift (time-delay) capabilities developed. Use of MMIC module technology promises to make feasible development of weight- and cost-effective phased-array antenna systems, identified as major factor in achieving minimum cost and efficient use of frequency and orbital resources of future generations of communication satellite systems. Use of MMIC transmitting modules provides for relatively simple method for phase-shift control of many separate radio-frequency (RF) signals required for phased-array antenna systems.

B86-10423

SIMULATOR TESTS CONTROLLER PERFORMANCE

M. F. LEMBECK (Caltech), and R. D. RASMUSSEN (Caltech)

Sep. 1986

NPO-15744

Vol. 10, No. 5, P. 52

Compact servosystem applies simulated dynamic loads, enabling realistic appraisal of motor and its control system without inconvenience of attaching real load. System simulates moments of inertia, rotational vibrations, changing load torques, and other characteristics of large or complex loads, without loads themselves and without awkwardness (and inaccuracy) of gravity-compensating devices used with such loads.

B86-10424

TRANSPONDER SYSTEM FOR HIGH-FREQUENCY RANGING

C. L. LICHTENBERG, P. W. SHORES, and H. S. KOBAYASHI

Sep. 1986

MSC-20912

Vol. 10, No. 5, P. 54

Transponder system uses phase difference between transmitted and reflected high-frequency radio waves to measure distance to target. To suppress spurious measurements of reflections from objects near target at transmitted frequency and its harmonics, transponder at target generates return signal at half transmitted frequency. System useful in such applications as surveying, docking of ships, and short-range navigation.

B86-10425

A PRIORITY PROTOCOL FOR TOKEN-RING NETWORKS

H. T. LIU (Caltech)

Sep. 1986

NPO-16683

Vol. 10, No. 5, P. 54

New priority protocol controls access to token-ring local-area network (LAN) of digital-communication stations over widely ranging mix of low- and high-priority traffic. Protocol, called round-robin priority scheme (RRPS), introduces only small overhead and therefore degrades system performance only minimally. Key messages guaranteed access to local-area network during peak loads.

B86-10426

GLOBAL TIMING WITH LOW- AND HIGH-ORBITING SATELLITES

S. C. WU (Caltech), and V. J. ONDRASIK (Caltech)

Sep. 1986

NPO-16407

Vol. 10, No. 5, P. 57

Report summarizes method for synchronizing clocks at intercontinental distances employing satellites of Global Positioning System (GPS) in high Earth orbit and transit satellite in orbit at

relatively low altitude of about 1,300 km. When fully implemented, method expected to supply precise time measurements for world-wide communication and navigation.

B86-10427

ADVANCED TRANSCEIVERS FOR FIREFIGHTERS

B. D. BLOOD (REMIC Corp.), O. P. GANDHI (REMIC Corp.), and R. E. RADKE (REMIC Corp.)

Sep. 1986

MFS-27040

Vol. 10, No. 5, P. 59

Report presents concept of improved portable radio transceiver for firefighters. Based in part on study of propagation of radio waves in such environments as high-rise buildings, ships, and tunnels. Study takes into account possible health hazard posed by personal transceivers and needs and wishes expressed by firefighters in interviews. Conceptual radio attaches to clothing to allow hands-free use; voice-actuated with microphone worn at throat. Speaker placed near wearer's shoulder. Flexible antenna placed either horizontally across shoulders, vertically at one shoulder, or on transceiver itself.

B86-10428

DIGITAL CONTROL OF DURABILITY-TESTING BURNER RIGS

D. L. DEADMORE

Sep. 1986 See Also N85-21321/NSP

LEW-14362

Vol. 10, No. 5, P. 60

Report describes hardware and software that implement hybrid digital control of two Jet A-1 fueled, mach-0.3 burners from startup to completion of preset number of hot-corrosion/flame-durability cycle tests of materials at 1,652 degree F (900 degree C). Surface temperatures controlled more precisely than before.

B86-10429

LOW-CONCENTRATION-RATIO SOLAR-CELL ARRAYS

M. S. BISS (Rockwell International Corp.), and DAVID A. REED, JR. (Rockwell International Corp.)

Sep. 1986

MFS-28022

Vol. 10, No. 5, P. 61

Paper presents design concept for mass-producible arrays of solar electric batteries and concentrators tailored to individual requirements. Arrays intended primarily for space stations needing about 100 kW of power. However, modular, lightweight, compact, and relatively low-cost design also fulfill requirements of some terrestrial applications. Arrays built with currently available materials. Pultrusions, injection molded parts, and composite materials used extensively to keep weight low. For added flexibility in design and construction, silicon and gallium arsenide solar-cell panels interchangeable.

B86-10454

INTERFACE PROGRAM FOR RELIABILITY PREDICTIONS

S. J. BAVUSO, J. L. PIERCE (Research Triangle Institute), P. L. PETERSEN (Kentron International, Inc.), and A. ROBERTS (Tesserract Systems)

Sep. 1986

LAR-13514

Vol. 10, No. 5, P. 92

CARE3MENU generates input file for CARE III program. Used to predict reliabilities of complex, redundant, fault-tolerant systems, including digital computers, aircraft, and nuclear and chemical control systems. CARE III input file often becomes complicated and not easily formatted with text editor. Provides easy interactive method of creating input file by automatically formatting set of user-supplied inputs for CARE III system. CARE3MENU provides detailed online help for most of its screen formats.

B86-10485

IMPROVED SPECTROMETER FOR FIELD USE

A. F. H. GOETZ (Caltech)

Nov. 1986

NPO-15732

Vol. 10, No. 6, P. 36

Proposed portable spectrometer for analyzing minerals in field generates spectral images like camera and process spectral data for real-time identification of materials. To identify unknown mineral, user locates significant peaks in displayed spectrum and matches them to spectrum in portfolio of reference spectra. Alternatively, user calls up display of prerecorded spectra in same wavelength region for comparison or allows spectrometer to determine best match automatically. New instrument makes it unnecessary to return data to laboratory or equipment trailer for processing.

B86-10486

THREE-FREQUENCY WATER-VAPOR RADIOMETER

M. A. JANSSEN (Caltech), and N. I. YAMANE (Caltech)

Nov. 1986

NPO-16531

Vol. 10, No. 6, P. 37

Measurements increase accuracies of delay predictions. Three-frequency microwave radiometer measures quantity of water vapor in atmosphere, part of effort to determine microwave-signal delays due to water vapor. Delay estimates necessary for accurate determination of distances in geodesy and related applications as very-long-baseline interferometry. Water-vapor data directly useful in weather research.

B86-10487

LASER-PULSE/FIBER-OPTIC LIQUID-LEAK DETECTOR

M. E. PADGETT

Nov. 1986

KSC-11331

Vol. 10, No. 6, P. 38

Several potential leak sites monitored using single sensing fiber. Fluid systems monitored quickly for leaks in remote, hazardous, or inaccessible locations by system of compact, lightweight fiber-optic leak sensors presently undergoing development. Sensors installed at potential leak sites as joints, couplings, and fittings. Sensor read by sending laser pulse along fiber, then noting presence or relative amplitude of return pulse. Leak-monitoring technique applicable to wide range of fluid systems and minimizes human exposure to toxic or dangerous fluids.

B86-10488

UNDERSTANDING MICROWAVE RADIOMETERS

J. M. STACEY (Caltech)

Nov. 1986

NPO-16586

Vol. 10, No. 6, P. 41

Report presents principles of microwave receivers for observing planetary surfaces from space. Report is tutorial and explains operation of receivers in detail to enable reader to specify and qualify them for spaceborne operation. Gives many examples to illustrate practical design procedures.

B87-10005

DESIGNING HIGH-FREQUENCY INDUCTORS

C. W. MCLYMAN (Caltech), and A. P. WAGNER (Caltech)

Jan. 1987

NPO-16553

Vol. 11, No. 1, P. 30

Procedures for ferrite-core and Molypermalloy-core inductors detailed. Report presents design procedures for two types of highfrequency inductors: those with iron or ferrite cores and lumped airgaps and those with Molypermalloy powder cores and distributed airgaps.

B87-10006

MEASURING ROOM AREA OR VOLUME ELECTRONICALLY

M. J. KAVAYA (Caltech)

Jan. 1987

02 ELECTRONIC SYSTEMS

NPO-16629

Vol. 11, No. 1, P. 32

Area- and volume-measuring instrument hand-held or mounted on tripod. Instrument rapidly measures distances to walls, ceiling, or floor at many viewing angles and automatically computes area or volume of room. Results obtained rapidly with minimal effort.

B87-10007

DOUBLE-REFERENCED, PULSED, PHASE-LOCKED LOOP - DRP2L2

J. S. HEYMAN, and F. D. STONE

Jan. 1987

LAR-13310

Vol. 11, No. 1, P. 34

System allows precise measurement of phase shift between two toneburst signals initially derived from same periodic source but delayed by different amounts through either path-length differences, propagation velocity differences, or both. Used to measure accurately phase shift encountered by acoustic wave striking front and back surfaces of sample. Velocity known, resulting measurement is of sample thickness. Thickness known, measurement is of sound velocity. Technique applies to many sources of radiation and not limited to acoustics.

B87-10008

OPTICAL INTERFEROMETRIC PARALLEL DATA PROCESSOR

J. B. BRECKINRIDGE (Caltech)

Jan. 1987

NPO-16382

Vol. 11, No. 1, P. 37

Image data processed faster than in present electronic systems. Optical parallel-processing system effectively calculates two-dimensional Fourier transforms in time required by light to travel from plane 1 to plane 8. Coherence interferometer at plane 4 splits light into parts that form double image at plane 6 if projection screen placed there.

B87-10059

PARALLEL ANALOG-TO-DIGITAL IMAGE PROCESSOR

D. C. LOKERSON

Feb. 1987

GSC-12898

Vol. 11, No. 2, P. 28

Proposed integrated-circuit network of many identical units convert analog outputs of imaging arrays of x-ray or infrared detectors to digital outputs. Converter located near imaging detectors, within cryogenic detector package. Because converter output digital, lends itself well to multiplexing and to post processing for correction of gain and offset errors peculiar to each picture element and its sampling and conversion circuits. Analog-to-digital image processor is massively parallel system for processing data from array of photodetectors. System built as compact integrated circuit located near local plane. Buffer amplifier for each picture element has different offset.

B87-10060

LOCAL DATA PROCESSING FOR A ROBOT HAND

A. K. BEJCZY (Caltech)

Feb. 1987

NPO-16695

Vol. 11, No. 2, P. 29

Integrated-circuit microcomputers process signals among sensors, external controls, and end-effector motor. Multiple-microprocessor system within end effector of remote manipulator accepts data from sensors in end effector, communicates with external control system, and controls end-effector motor. External system includes central control computer (which interacts with operator) and display. Local dataprocessing system in end effector relieves external control system of some of its computational load and minimizes data communication load with external higher level controller.

B87-10061

OPTOELECTRONIC DOCKING SYSTEM

S. M. WARD (Energy Optics, Inc.)

Feb. 1987

MSC-21159

Vol. 11, No. 2, P. 30

Sensors and computers control approach and coupling. Proposed optoelectronic system with no moving parts automatically controls approach of two spacecraft as they closed from distance of about 1 km to within few cm. System concept modified for use on Earth in robotic assembly, to control docking of large ships, or to guide placement of large structural components. Optoelectronic docking system automatically controls approach of active vehicle or mechanism to passive vehicle or object. Maneuvers of approaching vehicle controlled in response to optoelectronically sensed relative position of approached vehicle.

B87-10111

RADAR TIME-BASE AND PSEUDONOISE GENERATOR

S. S. BROKLE (Caltech)

Mar. 1987

NPO-16361

Vol. 11, No. 3, P. 26

Long pulses effectively compressed by pseudonoise technique. Computer-controlled, polynomial-driven time-base and pseudonoise generator enables radar system to achieve range resolution of about 80 m with radar pulses of 1-s duration. Normally, unmodulated 1-s pulse has relatively coarse range resolution of several thousand kilometers. Radar system effectively compresses modulated pulse into one of 100-ns pseudonoise-modulating pulses. Intended primarily for use with interplanetary radar, time-base/pseudonoise concept proves useful in test instruments or in time-base correction for video recording.

B87-10112

VLBI SYSTEM FOR SATELLITE NAVIGATION

J. M. ELLIS (Caltech)

Mar. 1987

NPO-16319

Vol. 11, No. 3, P. 28

Report discusses proposed low cost very-long-baseline interferometric (VLBI) system for use with Tracking and Data Relay Satellite System (TDRSS) in determining orbits of user satellites. Theoretical accuracies of orbits to be measured by new system compared with similar orbital determinations by other satellite-navigation system, based on anticipated state of VLBI art in year 1990.

B87-10113

DESIGN CONSIDERATIONS FOR HIGH-SPEED CONTROL SYSTEMS

S. A. JACKLIN, J. A. LEYLAND, and W. WARMBRODT

Mar. 1987

ARC-11670

Vol. 11, No. 3, P. 29

Existing hardware integrated into versatile, high-speed control system. Report discusses five global design considerations to integrate array-processor, multimicroprocessor, and host-computer system architectures into versatile, high-speed controllers. Such controllers are capable of control throughputs as high as 36 MHz for 8-bit bytes and maintain constant interaction with non-real-time or user environment. Application example, architecture of high-speed, closed-loop controller used to control helicopter vibration actively discussed.

B87-10164

VLSI-CHIP TESTER

LESLIE J. DEUTSCH (Caltech), and ERLAND M. OLSON (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16740**Vol. 11, No. 4, P. 24**

Compact test set integrated in computer-aided design system. Test set performs functional tests on very-large-scale integrated (VLSI) circuits. Makes tests from points within VLSI chip as well as at input and output pins. Used for quality control and design; in latter capacity, checks internal logic functions on chip and feed results directly to computer-aided design system for correction. Also simulates operation of chip design before chip is made. VLSI Tester contains three power supplies, control logic, and standard multibus circuit board in aluminum chassis. Chassis fits under platform of microprobe station. Multibus board links tester to interactive terminals and to host computer.

B87-10165**REDUCING COLOR/BRIGHTNESS INTERACTION IN COLOR TELEVISION**

ROBERT H. MARCHMAN (Lockheed Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11346**Vol. 11, No. 4, P. 25**

Proposed digitally sampled scan-conversion scheme for color television reduces unwanted interactions between chrominance and luminance signals. New scheme reduces luminance and chrominance bandwidth to increase frequency separation between signals. To avoid proportionally reducing horizontal brightness resolution and horizontal color resolution, horizontal interlace of luminance signal and two color-difference signals used.

B87-10166**HIGH-FREQUENCY AC POWER-DISTRIBUTION SYSTEM**

IRVING G. HANSEN (Lewis Research Center), and JAMES MILDICE (General Dynamics)

Apr. 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEL: 703-487-4650) (N86-24747/NSP)

LEW-14465**Vol. 11, No. 4, P. 26**

Loads managed automatically under cycle-by-cycle control. 440-V rms, 20-kHz ac power system developed. System flexible, versatile, and 'transparent' to user equipment, while maintaining high efficiency and low weight. Electrical source, from dc to 2,200-Hz ac converted to 440-V rms, 20-kHz, single-phase ac. Power distributed through low-inductance cables. Output power either dc or variable ac. Energy transferred per cycle reduced by factor of 50. Number of parts reduced by factor of about 5 and power loss reduced by two-thirds. Factors result in increased reliability and reduced costs. Used in any power-distribution system requiring high efficiency, high reliability, low weight, and flexibility to handle variety of sources and loads.

B87-10167**BASEBAND PROCESSOR FOR COMMUNICATION SATELLITES**

RUSSELL J. JIRBERG (Lewis Research Center), and PATRICK C. ARMSTRONG (Motorola Government Electronics Group)

Apr. 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEL: 703-487-4650) (N84-38251/NSP)

LEW-14239**Vol. 11, No. 4, P. 27**

Baseband processing (BBP) system for advanced satellite communications successfully demonstrated. Provides increased data capacity through frequency-reusing multibeam antenna systems, using time-division multiple access (TDMA) and onboard satellite switching. Large numbers of thin-route trunking stations and user-based Earth terminals handled efficiently by satellite baseband switching. With BBP system, satellite routes data messages individually among locations anywhere in continental United States. Processes, controls, and routes message traffic among users. Time-division multiple access and baseband switching used.

B87-10186**PROGRAM FOR SPACE SHUTTLE PAYLOAD CABLING**

ROGER D. SCHULTZ (Abacus Programming Corp.), and C. ROGERS SAXON (Abacus Programming Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21121**Vol. 11, No. 4, P. 48**

EXCABL is expert-system computer program developed to route electrical cables in Space Shuttle Orbiter payload bay for each mission. Automates cable-routing process and provides data for cable-installation documents. Automation increased speed and accuracy of payload-integration process, and expert system codifies knowledge cabling experts have acquired. Written in ART.

B87-10187**SIMULATION OF AFC FOR A DMSK RECEIVER**

FARAMAZ DAVARIAN (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16800**Vol. 11, No. 4, P. 48**

Low bit rates suitable for low-cost satellite communications. LOOP computer program written to simulate automatic frequency control (AFC) subsystem of differential minimum-shift keying (DMSK) receiver with bit rate of 2,400 baud. AFC simulated by LOOP is first-order loop configuration with first-order resistance-and-capacitance filter. Written in MS SuperSoft FORTRAN 77.

B87-10216**EMERGENCY-RADIO MODULATION WOULD IDENTIFY TYPE OF VEHICLE**

PAUL WREN

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-12845**Vol. 11, No. 5, P. 26**

New emergency beacon similar to conventional one, except modulation interrupted periodically while unmodulated carrier is transmitted. Modulation scheme for emergency radio beacons aids searchers by indicating kind of vehicle in distress. Transmitted signal similar to present standard signal of emergency locator transmitters (ELT's) and emergency position-indicating radio beacons (EPIRB's) but also includes periods of unmodulated carrier.

B87-10217**INTERFACE FOR A MULTIPLE-USER COMPUTER SYSTEM**

PAUL A. HEADLEY (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16556**Vol. 11, No. 5, P. 27**

Diverse hardware and software connected with minimal inconvenience to users. Central controller for large multiple-user computer network makes various computer services compatible regardless of diversity of hardware and software. Users readily gain access to host computer and other terminals and services. Need be familiar only with language and procedures of their own terminals, even when communicating with normally incompatible services or users.

B87-10218**CONTROLLING MULTIPLE REGISTERS ON A COMPUTER BUS**

STANLEY S. BROKL (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

02 ELECTRONIC SYSTEMS

MD. 21240-0757

NPO-16880

Vol. 11, No. 5, P. 28

Number of addressable registers increased. Monitoring and controlling interface circuit expands capabilities of DR11-C (or equivalent) input/output port for computer that communicates with peripheral equipment via UNIBUS (or equivalent) data bus. Using only three address locations on bus, unit enables any number of external registers to be addressed, read, or written.

B87-10231

ANALYZING FEEDBACK CONTROL SYSTEMS

FRANK H. BAUER, and JOHN P. DOWNING (Old Dominion Systems, Inc.)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12998

Vol. 11, No. 5, P. 42

Interactive controls analysis (INCA) program developed to provide user-friendly environment for design and analysis of linear control systems, primarily feedback control. Designed for use with both small- and large-order systems. Using interactive-graphics capability, INCA user quickly plots root locus, frequency response, or time response of either continuous-time system or sampled-data system. Configuration and parameters easily changed, allowing user to design compensation networks and perform sensitivity analyses in very convenient manner. Written in Pascal and FORTRAN.

B87-10266

GAIN-COMPENSATING CIRCUIT FOR NDE AND ULTRASONICS

PETER W. KUSHNICK (PRC Kentron, Inc.)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13543

Vol. 11, No. 6, P. 28

High-frequency gain-compensating circuit designed for general use in nondestructive evaluation and ultrasonic measurements. Controls gain of ultrasonic receiver as function of time to aid in measuring attenuation of samples with high losses; for example, human skin and graphite/epoxy composites. Features high signal-to-noise ratio, large signal bandwidth and large dynamic range. Control bandwidth of 5 MHz ensures accuracy of control signal. Currently being used for retrieval of more information from ultrasonic signals sent through composite materials that have high losses, and to measure skin-burn depth in humans.

B87-10267

TRELLIS-CODED MODULATION FOR FADING CHANNELS

MARVIN K. SIMON (Caltech), and DARIUSH DIVSALAR (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16904

Vol. 11, No. 6, P. 29

In proposed communication system, digital signals transmitted efficiently over fading channel by combination of trellis coding and multiple-phase-shift keying with addition of asymmetry to signal set. Coding and modulation schemes not designed separately as in previous systems but integrated to yield bandwidth-efficient modulation and forward-error-correction coding. Helps to satisfy need for reliable high-quality transmission of voice and data between land-mobile units via satellites, where limitations of power and bandwidth imposed simultaneously. Also applicable to ionospheric communications between fixed or mobile units.

B87-10268

VISUAL SPEECH-TRAINING AID FOR THE DEAF

ROBERT J. MILLER

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11526

Vol. 11, No. 6, P. 30

Teaching deaf to speak aided by electronic system provides striking colored, pictorial representation of sound; energy at different frequencies as function of time. Other modalities, such as nasality, intra-oral pressure, and lip-muscle contraction, pictorialized simultaneously. Use of standard components, including personal microcomputer, helps reduce cost below prior voice-training systems. Speech-training system, microphone output separated by filters into narrow frequency bands, changed into digital signals, formatted by computer, and displayed on television screen. Output from other sensors displayed simultaneously or screen split to allow sound produced by student to be compared with that of teacher.

B87-10269

NONCONTACTING THERMOMETER

LYNN M. WYETT (Rockwell International Corp.)

Jun. 1987 No additional information available: For specific technical questions contact TU Officer at center of origin

MFS-29277

Vol. 11, No. 6, P. 31

Proposed laser/ultrasonic thermometer measures bulk and surface temperatures of part without physical contact. No sensors or wire connections needed on part, moving or stationary. Problems of bonding sensors, of mutual diffusion of materials between sensor and part, and of disturbances of fluid and heat flows by sensor avoided. Single thermometer used to measure many parts remotely.

B87-10316

DATA BUS ADAPTS TO CHANGING TRAFFIC LEVEL

EUGENE LEW (Sperry Aerospace and Marine), JOHN DERUITER (Sperry Aerospace and Marine), and MIKE VARGA (Sperry Aerospace and Marine)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12967

Vol. 11, No. 7, P. 36

Access becomes timed when collisions threaten. Two-mode scheme used to grant terminals access to data bus. Causes bus to alternate between random accessibility and controlled accessibility to optimize performance and adapt to changing data-traffic conditions. Bus is part of 100-Mb/s optical-fiber packet data system.

B87-10317

ROBOT-ARM DYNAMIC CONTROL BY COMPUTER

ANTAL K. BEJCZY (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), TZYH J. TARN (Washington University), and YILONG J. CHEN (General Motors Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16742

Vol. 11, No. 7, P. 38

Feedforward and feedback schemes linearize responses to control inputs. Method for control of robot arm based on computed nonlinear feedback and state transformations to linearize system and decouple robot end-effector motions along each of cartesian axes augmented with optimal scheme for correction of errors in workspace. Major new feature of control method is: optimal error-correction loop directly operates on task level and not on joint-servocontrol level.

B87-10318

PORTABLE-BEACON LANDING SYSTEM FOR HELICOPTERS

THOMAS J. DAVIS, GEORGE R. CLARY, JOHN P. CHISHOLM (Sierra Nevada Corp.), and STANLEY L. MACDONALD (Sierra

Nevada Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11674

Vol. 11, No. 7, P. 39

Prototype beacon landing system (BLS) allows helicopters to make precise landings in all weather. BLS easily added to existing helicopter avionic equipment and readily deployed at remote sites. Small and light, system employs X-band radar and digital processing. Variety of beams pulsed sequentially by ground station after initial interrogation by weather radar of approaching helicopter. Airborne microprocessor processes pulses to determine glide slope, course deviation, and range.

B87-10384

REDUNDANT CONTROL FOR AIR-CIRCULATION VALVES

R. JOHNSON, JR. (United Technologies Corp.), B. TRUSTEE (United Technologies Corp.), and W. FISCHER (United Technologies Corp.)

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11531

Vol. 11, No. 8, P. 34

Four computers that control airflow to 'X-wing' helicopter rotor arranged in redundant configuration. Ensures circulation control of rotor continues to function even if two of computers fail. Rotor uses 48 valve actuators regulating distribution and quantity of air flowing from leading and trailing edges.

B87-10385

PORTABLE SPEECH SYNTHESIZER

GILBERT H. LEIBFRITZ, and HOWARD K. LARSON

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11595

Vol. 11, No. 8, P. 34

Compact speech synthesizer useful traveling companion to speech-handicapped. User simply enters statement on board, and synthesizer converts statement into spoken words. Battery-powered and housed in briefcase, easily carried on trips. Unit used on telephones and face-to-face communication. Synthesizer consists of micro-computer with memory-expansion module speech-synthesizer circuit, batteries, recharger, dc-to-dc converter, and telephone amplifier. Components, commercially available, fit neatly in 17-by 13-by 5-in. briefcase. Weighs about 20 lb (9 kg) and operates and recharges from ac receptacle.

B87-10386

IMAGING RADAR POLARIMETER

HOWARD A. ZEBKER (Caltech), DANIEL N. HELD (Caltech), and WALTER E. BROWN (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16875

Vol. 11, No. 8, P. 36

Radar measures full polarization tensor of each element in scene in one sweep. New system comprises dual-polarized antenna, single transmitter, and four-channel receiver and digital recorder installed in aircraft, plus digital processor on ground. Produces radar-backscatter images corresponding to 10- by 10-km regions on ground. Signals recorded from orthogonal linearly polarized antennas combined in computer after flight to synthesize any desired combination of transmitted and received polarizations. Data recorded on single flight processed to provide multiple images.

B87-10404

A COMPUTER SYSTEM FOR MISSION MANAGERS

ROBERT TOLCHIN (Abacus Programming Corp.), SATHY ACHAR (Abacus Programming Corp.), TINA YANG (Abacus Programming

Corp.), and TOM LEE (Abacus Programming Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21092

Vol. 11, No. 8, P. 54

Mission Managers' Workstation (MMW) is personal-computer-based system providing data management and reporting functions to assist Space Shuttle mission managers. Allows to relate events and stored data in timely and organized fashion. Using MMW, standard reports formatted, generated, edited, and electronically communicated with minimum clerical help. Written in PASCAL, BASIC, and assembler.

B87-10405

CONTROL-SYSTEM DESIGN PROGRAM

HAROLD P. FRISCH

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13067

Vol. 11, No. 8, P. 54

Control-theory design package, Optimal Regulator Algorithms for Control of Linear Systems (ORACLS), developed to aid in design of controllers and optimal filters for systems modeled by linear, time-invariant differential and difference equations. Optimal linear quadratic regulator theory, Linear-Quadratic-Gaussian (LQG) problem, most widely accepted method of determining optimal control policy. Provides for solution to time-invariant continuous or discrete LQG problems. Attractive to control-system designer providing rigorous tool for dealing with multi-input and multi-output dynamic systems in continuous and discrete form. CDO version written in FORTRAN IV. VAX version written in FORTRAN 77.

B87-10449

INTERFACE CIRCUIT FOR LASER DOPPLER VELOCIMETERS

DEAN R. HARRISON, and JAMES L. BROWN

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11536

Vol. 11, No. 9, P. 42

New circuit displays more information to user and provides higher data-collection rates. Interface circuit facilitates coupling of laser-Doppler-velocimeter outputs to computer for analysis. Enables user to select variety of intermediate data-processing options, including clock frequency, coincidence channel combinations, coincidence times, dead times, digital or analog output, and channels to be analyzed.

B87-10450

ULTRASONIC RANGING SYSTEM WITH INCREASED RESOLUTION

WILLIAM E. MEYER (Rockwell International Corp.), and WILLIAM G. JOHNSON (Rockwell International Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21090

Vol. 11, No. 9, P. 44

Master-oscillator frequency increased. Ultrasonic range-measuring system with 0.1-in. resolution provides continuous digital display of four distance readings, each updated four times per second. Four rangefinder modules in system are modified versions of rangefinder used for automatic focusing in commercial series of cameras. Ultrasonic pulses emitted by system innocuous to both people and equipment. Provides economical solutions to such distance-measurement problems as posed by boats approaching docks, truck backing toward loading platform, runway-clearance readout for tail of airplane with high angle attack, or burglar alarm.

02 ELECTRONIC SYSTEMS

B87-10451

BINARY-SYMMETRY DETECTION

HIRAM LOPEZ

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12985

Vol. 11, No. 9, P. 46

Transmission errors for zeros and ones tabulated separately. Binary-symmetry detector employs pseudo-random data pattern used as test message coming through channel. Message then modulo-2 added to locally generated and synchronized version of test data pattern in same manner found in manufactured test sets of today. Binary symmetrical channel shows nearly 50-percent ones to 50-percent zeroes correspondence. Degree of asymmetry represents imbalances due to either modulation, transmission, or demodulation processes of system when perturbed by noise.

B87-10452

OPTICAL DESIGN AND SIGNAL PROCESSING FOR EDGE DETECTION

FRIEDRICH O. HUCK, and KATHRYN STACY (Computer Sciences Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13416

Vol. 11, No. 9, P. 47

Properly combining optical design with 3-by-3 element mask reduces number of required computations by factor of as much as 100. Spatial and spatial-frequency responses obtained in system of combination of optical design and signal-processing algorithm. Closely approximate difference-of-Gaussian-function response.

B87-10453

CENTRAL PROCESSOR ACTS AS HIGH-SPEED DMA CONTROLLER

MATTHEW S. BLAHA (The Charles Stark Draper Laboratory, Inc.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13497

Vol. 11, No. 9, P. 47

Computer-system architecture enables system host central processor (CP) to make high-speed, direct-memory-access (DMA) data transfers without cost and complexity of adding dedicated DMA controller. New system, CCP used as DMA controller, obviating need for dedicated DMA controller; yet maximum transfer rates equivalent to those obtained with dedicated DMA controller. Useful wherever dedicated DMA controller desired because of required data-transfer rates.

B87-10454

PREDICTING FALSE LOCK IN PHASE-LOCKED LOOPS

BILL REED, and JOHN L. STENSBY (University of Alabama)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27110

Vol. 11, No. 9, P. 48

Theoretical paper discusses advances in mathematical analysis of phase-locked loops. Presents new results in prediction of false locking. Interest to users of phase-lock circuits and to researchers seeking ways to detect or avoid false lock. Equations solved numerically by Newton-Raphson technique, with Jacobian computed by finite-difference scheme. Algorithm produces results limited only by precision of computer on which executed.

B87-10518

OPTOELECTRONIC PROXIMITY SENSOR FINDS EDGES

ANTAL K. BEJCZY (Caltech)

Nov. 1987 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16697

Vol. 11, No. 10, P. 40

Seams tracked for automatic control of welding. Optoelectronic system based on relatively simple array of optical proximity sensors locates edge of plate. Used to control automatic production machinery. System follows curved seams as well as straight ones, and neither special control programming nor precise initial positioning workpiece necessary for accurate tracking of seam.

B87-10519

DISTRESS TRANSMITTER AND RECEIVER

PAUL E. WREN

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12821

Vol. 11, No. 10, P. 42

Identifying distress signals sent and received automatically. Radio transmitter and receiver designed to be used together for location and identification of persons, aircraft, or ships in distress. Modulation of transmitted signal characterized by unique combination of frequencies, repetition rates, and duty cycles, so type or identity of vehicle or person in distress ascertained from signal. Receiver operates manually and monitored aurally in conventional manner; also includes automatic tuning and monitoring features to assist operator in measuring modulation characteristics and in detecting weak signals. Transmitter generates signal characterized by timed sequence of modulating pulses. Receiver automatically locks onto signal and identifies it according to modulation characteristics.

B87-10520

SOLAR-POWERED SENSOR MODULE

J. MICHAEL JOHNSON (Hughes Aircraft Co.)

Nov. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N87-11343/NSP)

LAR-13454

Vol. 11, No. 10, P. 44

Hybrid sensor module with no external electrical interconnections includes optical data link. Measures such parameters as temperature, acceleration, and strain. Module transmits measurement data to central unit and receives control signals via light beams.

B87-10521

DIGITAL CONTROL FOR REMOTE MANIPULATORS

ANTAL K. BEJCZY (Caltech), and RONALD S. DOTSON (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16879

Vol. 11, No. 10, P. 45

Multiple microprocessors enable large separations between controllers and manipulators. Controller for remote manipulator requires no direct mechanical connection between slave arm and master arm moved by human operator. Employs two-way digital data transmission rather than mechanical linkage between master and slave. Manipulator a considerable distance from operator. Software for controller distributed between master and slave locations. Organized into modules. Hardware and software for system demonstrated in laboratory model.

B87-10522

INTERFACE FOR COLOR-VIDEO MONITOR

ERIC RODRIGUEZ

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13076

Vol. 11, No. 10, P. 46

Commercially produced color-video monitor modified by addition of interface circuit to accommodate wider-than-usual range of scanning rates and resolutions. Interface circuit measures frequencies of horizontal- and vertical-synchronizing pulses. When frequencies fall within combination of preset ranges, interface generates associated preset combination of eight picture-adjusting signals. Video monitor 'trained' by computer that helps to control calibration procedure and inserts values in calibration tables.

B87-10523**SELF-IDENTIFYING EMERGENCY RADIO BEACONS**

MORTON L. FRIEDMAN

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13089**Vol. 11, No. 10, P. 47**

Rescue teams aided by knowledge of vehicle in distress. Similar to conventional emergency transmitters except contains additional timing and modulating circuits. Additions to standard emergency transmitter enable transmitter to send rescuers identifying signal in addition to conventional distress signal created by sweep generator. Data generator contains identifying code.

B87-10524**CAVITY-MODULATION AUTOTUNER FOR HYDROGEN MASER**

G. J. DICK (Caltech), and T. K. TUCKER (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16906**Vol. 11, No. 10, P. 48**

Cavity-modulation tuning system maintains resonance of hydrogen-maser cavity automatically, stabilizing maser frequency, without introducing undesirable frequency modulation. System tunes maser cavity rapidly by modulating one of physical characteristics of cavity affecting resonant frequency. Frequency-controlling components of tuning system placed at maser cavity, within maser vacuum. Thermal environment well controlled, and device insensitive to driving signal. Features contribute to stability of maser frequency.

B87-10525**PORTABLE TEST AND MONITORING SYSTEM FOR WIND-TUNNEL MODELS**

CHARLES A. POUPARD

Nov. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13405**Vol. 11, No. 10, P. 49**

Portable system developed to test and monitor instrumentation used in wind-tunnel models. Self-contained and moves easily to model, either before or after model installed in wind tunnel. System is 44 1/2 in. high, 22 in. wide, and 17 in. deep and weighs 100 lb. Primary benefits realized with portable test and monitoring system associated with saving of time.

B88-10015**ELECTRONIC NEURAL NETWORKS**

JOHN LAMBE (Caltech), ALEXANDER MOOPEN (Caltech), and ANILKUMAR THAKOOR, P. (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16680**Vol. 12, No. 1, P. 42**

Memory based on neural network models content-addressable and fault-tolerant. System includes electronic equivalent of synaptic network; particular, matrix of programmable binary switching elements over which data distributed. Switches programmed in parallel by outputs of serial-input/parallel-output shift registers. Input and output terminals of bank of high-gain nonlinear amplifiers

connected in nonlinear-feedback configuration by switches and by memory-prompting shift registers.

B88-10016**UNIFIED ROBOT-CONTROL SYSTEM**

ZOLTAN F. SZAKALY (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17134**Vol. 12, No. 1, P. 44**

Robot-joint motors integrated with control computer or computers. Robot controller uses only 1 microprocessor to control as many as 16 joint-actuating motors. Control system uses high-speed bus to communicate with joint-interface circuits, addressing scheme to write commands to several motors simultaneously, and efficient assembly-language servo code. Features enable control of 16 joints at 1-kHz servo rate. Suitable for control of motors in numerically-controlled manufacturing systems. Use of single joint-control processor results in few components, lower cost, and simpler architecture.

B88-10017**THE MARK III HYPERCUBE-ENSEMBLE COMPUTERS**

JOHN C. PETERSON (Caltech), JESUS O. TUAZON (Caltech), DON LIEBERMAN (Caltech), and MOSHE PNIEL (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16772**Vol. 12, No. 1, P. 46**

Mark III Hypercube concept applied in development of series of increasingly powerful computers. Processor of each node of Mark III Hypercube ensemble is specialized computer containing three subprocessors and shared main memory. Solves problem quickly by simultaneously processing part of problem at each such node and passing combined results to host computer. Disciplines benefitting from speed and memory capacity include astrophysics, geophysics, chemistry, weather, high-energy physics, applied mechanics, image processing, oil exploration, aircraft design, and microcircuit design.

B88-10018**DUAL PILOT-TONE CALIBRATION TECHNIQUE**

MARVIN K. SIMON (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16930**Vol. 12, No. 1, P. 47**

Signal-to-noise ratio increased. Proposed phase-shift-keying scheme for radio transmission of digital signals include two pilot tones, one near each of frequency band. Carrier frequency synthesized from two pilot-tone frequencies in dual-pilot-calibrated receiver. Effective composite carrier signal derived from pilot tones used to demodulate coherently data portion of received signal.

B88-10019**PUBLIC-FACILITIES LOCATOR FOR THE BLIND**

KEVIN D. MOORE (Lockheed Engineering and Management Services Co., Inc.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21197**Vol. 12, No. 1, P. 49**

Proposed optoelectronic system guides blind people to important locations in public buildings. With system, sightless person easily determines directions and distances of restrooms, water fountains, stairways, emergency exits, and elevators. Circuitry uncomplicated and inexpensive, in both transmitter and receiver.

02 ELECTRONIC SYSTEMS

Readily-available light-emitting diodes, photodiodes, and integrated-circuit chips used to build locator aid for the blind.

B88-10020

AUTOMATICALLY INSPECTING THIN CERAMICS FOR PINHOLES

JAMES R. HONAKER (Rockwell International Corp.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21091

Vol. 12, No. 1, P. 49

Proposed apparatus for inspecting prefired ceramic materials detects minute flaws that might escape ordinary visual inspections. Method detects flaws and marks locations. Intended for such thin ceramic parts as insulation in capacitors and some radio-frequency filters.

B88-10021

MILLIMETER-WAVE RADIOMETER IMAGER

W. J. WILSON (Caltech), R. J. HOWARD (Caltech), A. C. IBBOTT (Caltech), G. S. PARKS (Caltech), and W. B. RICKETTS (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17051

Vol. 12, No. 1, P. 50

A 3-mm radiometer system with mechanically scanned antenna built for use on small aircraft or helicopter to produce near-real-time moderate-resolution images of ground. Main advantage of passive imaging sensor able to provide information through clouds, smoke, and dust when visual and infrared (IR) systems unusable. Used also for variety of remote-sensing applications such as measurements of surface moisture, snow cover, vegetation type and extent, mineral type and extent, surface temperature, and thermal inertia. Possible to map fires and volcanic lava flows through obscuring clouds and smoke.

B88-10022

POSITION AND FORCE CONTROL FOR MULTIPLE-ARM ROBOTS

SAMAD A. HAYATI (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16811

Vol. 12, No. 1, P. 54

Number of arms increased without introducing undue complexity. Strategy and computer architecture developed for simultaneous control of positions of number of robot arms manipulating same object and of forces and torques that arms exert on object. Scheme enables coordinated manipulation of object, causing it to move along assigned trajectory and be subjected to assigned internal forces and torques.

B88-10023

LIGHTWEIGHT VIDEO-CAMERA HEAD

DAVID R. PROCTOR (Technology, Inc.)

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21246

Vol. 12, No. 1, P. 55

Compact, lightweight video camera head constructed by remounting lens and charge-coupled-device image detector from small commercial video camera in separate assembly. Useful in robotics, artificial vision, and vision guidance systems. Designed to be mounted on visor of helmet to monitor motions of eyes in experiments on vestibulo-ocular reflexes.

B88-10024

TELEVISION-AND-LASER RANGE-MEASURING SYSTEM

J. KEVIN RUSSELL (Lockheed Engineering and Management

Services Co., Inc.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20867

Vol. 12, No. 1, P. 56

Triangulation system measures angle between two lines of sight to point on object, determining distance to object. Amenable to automation. Includes automatically aimed rotatable mirrors and laser beam to define one of lines of sight. Adjusts automatically to bring two lines of sight into convergence at common point on object.

B88-10025

MINIMUM-TIME CONTROL FOR ROBOTIC MANIPULATORS

JOHN T. WEN (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17070

Vol. 12, No. 1, P. 57

Current theories examined critically. Report surveys state of art in theory of minimum-time control of robotic manipulators. Discusses some of the promising developments, pointing out, however, optimal-control problem in full generality remains unsolved. Compares various solution methods, indicating merits and flaws.

B88-10079

ADAPTIVE BANDWIDTH COMPRESSION FOR MOVING IMAGES

OLIN L. GRAHAM

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20821

Vol. 12, No. 2, P. 24

Data compressed in images with fast motion and expanded when motion slows. Proposed data-compression scheme adapts transmission rate for moving image to speed of motion of image. Laser rangefinder measures speed of target. Adaptive sampler determines required resolution of target image on basis of measured speed and provides decommutator at control station with more or fewer partial image fields per unit time. When monitor displays maximum number of fields simultaneously, resolution is highest.

B88-10080

STEREOSCOPIC OPTICAL SIGNAL PROCESSOR

GLENN D. GRAIG

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-25752

Vol. 12, No. 2, P. 26

Optical signal processor produces two-dimensional cross correlation of images from stereoscopic video camera in real time. Cross correlation used to identify object, determines distance, or measures movement. Left and right cameras modulate beams from light source for correlation in video detector. Switch in position 1 produces information about range of object viewed by cameras. Position 2 gives information about movement. Position 3 helps to identify object.

B88-10081

A WORK STATION FOR CONTROL OF CHANGING SYSTEMS

DANIEL J. MANDL

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13106

Vol. 12, No. 2, P. 28

Touch screen and microcomputer enable flexible control of complicated systems. Computer work station equipped to produce

graphical displays used as command panel and status indicator for command-and-control system. Operator uses images of control buttons displayed on touch screen to send prestored commands. Use of prestored library of commands reduces incidence of errors. If necessary, operator uses conventional keyboard to enter commands in real time to handle unforeseeable situations.

B88-10082

COMPUTER INTERFACE FOR A SPECTROREFLECTOMETER
WILLIAM A. HURD (Radiometrics, Inc.), and GLENN B. SHELTON (Radiometrics, Inc.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26021

Vol. 12, No. 2, P. 28

FORTTRAN program controls stepping motors and signal-processing electronics via S-100 computer bus. Group of spectrophotometers modified to provide computer-controlled operation and data collection. Analog and digital signal-processing circuits enable use of computerized automatic data collection and analysis. Previously, spectrophotometer data recorded on strip charts.

B88-10083

ROBOT GRIPPER WITH SIGNAL PROCESSING

RICHARD R. KILLION (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16977

Vol. 12, No. 2, P. 30

Single-chip computer and sensor-circuit chips preprocess sensor data. Self-contained circuitry combines sensor signals for serial digital transmission. Gripping surfaces crossed with grooves for grasping differently shaped objects. Gripper cavities house sensors and preprocessing circuitry. Sensors and preprocessing circuitry in robot gripper reduce amount of data being transmitted between robot controller and gripper. Placement in gripper reduces signal delays and vulnerability to electromagnetic interference.

B88-10084

TRENDS IN SATELLITE COMMUNICATION

WILLIAM A. POLEY, GRADY H. STEVENS, STEVEN M. STEVENSON, JACK LEKAN, CLIFFORD H. ARTH, JAMES E. HOLLANSWORTH, and EDWARD F. MILLER

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N87-13600/NSP)

LEW-14548

Vol. 12, No. 2, P. 32

Report assesses trends in satellite communication from present to year 2010. Examines restrictions imposed by limited spectrum resource and technology needs created by trends. Personal communications, orbiting switchboards, and videophones foreseen.

B88-10085

STUDIES OF SINGLE-EVENT-UPSET MODELS

J. A. ZOUTENDYK (Caltech), L. S. SMITH (Caltech), and G. A. SOLI (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16735

Vol. 12, No. 2, P. 33

Report presents latest in series of investigations of 'soft' bit errors known as single-event upsets (SEU). In this investigation, SEU response of low-power, Schottky-diode-clamped, transistor/transistor-logic (TTL) static random-access memory (RAM) observed during irradiation by Br and O ions in ranges of 100 to 240 and 20 to 100 MeV, respectively. Experimental data complete verification of computer model used to simulate SEU in this circuit.

B88-10086

ADAPTIVE CONTROL FOR FLEXIBLE STRUCTURES

DAVID S. BAYARD (Caltech), CHE-HANG CHARLES IH (Caltech), and SHYH JONG WANG (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17115

Vol. 12, No. 2, P. 34

Paper discusses ways to cope with measurement noise in adaptive control system for large, flexible structure in outer space. System generates control signals for torque and thrust actuators to turn all or parts of structure to desired orientations while suppressing torsional and other vibrations. Main result of paper is general theory for introduction of filters to suppress measurement noise while preserving stability.

B88-10113

BIBLIOGRAPHY ON MULTIPROCESSORS AND DISTRIBUTED PROCESSING

EUGENE N. MIYA

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11568

Vol. 12, No. 2, P. 62

Multiprocessor and Distributed Processing Bibliography package consists of large machine-readable bibliographic data base, which in addition to usual keyword searches, used for producing citations, indexes, and cross-references. Data base contains UNIX(R) 'refer' -formatted ASCII data and implemented on any computer running under UNIX(R) operating system. Easily convertible to other operating systems. Requires approximately one megabyte of secondary storage. Bibliography compiled in 1985.

B88-10160

HANDLING FLIGHT-RESEARCH DATA IN REAL TIME

ARCHIE L. MOORE

Mar. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-19330)

ARC-11746

Vol. 12, No. 3, P. 26

Researchers at widely separated locations able to participate in tests and analyze data immediately. Basic data-handling needs common: Communicates with vehicle, pilot, and test team; Acquires, computes, and displays data; knows exact location of research vehicle at all times. Continuing challenge for designers and operators of ground support facilities to perform tasks in real time and present integrated results to research team in real time. Paper presents several approaches to satisfaction of requirements of representative types of aircraft research programs at NASA Western Aeronautical Test Range of Ames Research Center.

B88-10161

DIGITAL-DIFFERENCE PROCESSING FOR COLLISION AVOIDANCE.

PAUL SHORES, CHRIS LICHTENBERG, HERBERT S. KOBAYASHI, and ALLEN R. CUNNINGHAM

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20865

Vol. 12, No. 3, P. 28

Digital system for automotive crash avoidance measures and displays difference in frequency between two sinusoidal input signals of slightly different frequencies. Designed for use with Doppler radars. Characterized as digital mixer coupled to frequency counter measuring difference frequency in mixer output. Technique determines target path mathematically. Used for tracking cars, missiles, bullets, baseballs, and other fast-moving objects.

02 ELECTRONIC SYSTEMS

B88-10162

DATA-ACQUISITION SYSTEM FOR ROTOR VIBRATIONS

STEPHEN J. POSTA, and GERALD V. BROWN

Mar. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-14730)

LEW-14557

Vol. 12, No. 3, P. 30

New system trades hardware for software to reduce cost. Composite train of interspersed blade-detection pulses produced by gates at four probe ports on data-acquisition board. Pulses latch count from high-speed wraparound clock counter and initiate writing of count onto current address of memory. Result: time corresponding to each blade passage stamped into memory.

B88-10163

SIGNAL GENERATOR COMPENSATES FOR PHASE SHIFT IN CABLE

E. H. SIGMAN (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17001

Vol. 12, No. 3, P. 31

Stabilized reference signal delivered to remote unit. Signals at two different frequencies transmitted back and forth along cable and mixed to measure propagation delay in cable. Delay-measuring circuitry part of feedback loop constraining overall delay at stable value. Intended for use in system generating precise time and frequency signals, signal-generating subsystem compensates for phase shift in cable.

B88-10164

REAL-TIME PROCESSOR FOR SYNTHETIC-APERTURE RADAR

KUANG Y. LIU (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17188

Vol. 12, No. 3, P. 32

Images formed aboard airplane. Data processor for synthetic-aperture radar (SAR) operates aboard airplane with radar equipment to produce images of scanned terrain in real time. Providing images immediately, new processor enables SAR operator to monitor scanning activity. Processed images recorded on tape or transmitted to ground stations.

B88-10165

LANDING-TIME-CONTROLLED MANAGEMENT OF AIR TRAFFIC

HEINZ ERZBERGER, and LEONARD TOBIAS

Mar. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-28049)

ARC-11713

Vol. 12, No. 3, P. 33

Conceptual system controls aircraft with old and new guidance equipment. Report begins with overview of concept, then reviews controller-interactive simulations. Describes fuel-conservative-trajectory algorithm, based on equations of motion for controlling landing time. Finally, presents results of piloted simulations.

B88-10166

SENSOR-FAILURE SIMULATOR

KEVIN J. MELCHER, JOHN C. DELAAT, WALTER C. MERRILL, LAWRENCE G. OBERLE, and GERALD G. SADLER

Mar. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-31792)

LEW-14533

Vol. 12, No. 3, P. 33

Outputs of defective sensors simulated for studies of reliability of control systems. Real-time sensor-failure simulator (SFS) designed and built for use with Advance Detection, Isolation, and

Accommodation (ADIA) program. Equipment consists of IBM PC/XT computer and associated analog circuitry. User defines failure scenarios to determine which sensor signals fail and method(s) used to simulate failure.

B88-10167

RESEARCH IN OPTICAL PROCESSING OF DATA

DAVID ENNIS, and DAVID JARED (Sterling Software)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11758

Vol. 12, No. 3, P. 34

Report describes current research in optical processing of data at NASA's Ames Research Center. Describes advanced optical feature extractor performing Fourier-Mellin transform to generate feature vector invariant under changes of scale and position and responds to rotation with simple translation. Potential advantages include high speed and low cost.

B88-10168

IMPROVED TRACKING OF SQUARE-WAVE SUBCARRIER

WILLIAM J. HURD (Caltech), and SERGIO AGUIRRE (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17135

Vol. 12, No. 3, P. 35

Variance of phase error reduced. Report discusses application of 'windowing' concept to improve ability of telemetry receiver to track phase of square-wave phase-modulation subcarrier signal. Concept based on setting phase-tracking signal at zero outside narrow time 'windows', reducing noise energy in processed signal. Result is increase in signal-to-noise ratio in tracking loop with consequent increase in accuracy of tracking and reduction in number of errors in telemetric data.

B88-10169

CHECKING FITS WITH DIGITAL IMAGE PROCESSING

R. M. DAVIS, and W. D. GEASLEN (EG and G Space Systems)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11367

Vol. 12, No. 3, P. 36

Computer-aided video inspection of mechanical and electrical connectors feasible. Report discusses work done on digital image processing for computer-aided interface verification (CAIV). Two kinds of components examined: mechanical mating flange and electrical plug.

B88-10186

SPECTRUM/ORBIT-UTILIZATION PROGRAM

EDWARD F. MILLER, PAUL SAWITZ (ORI, Inc.), and FRED ZUSMAN (ORI, Inc.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14461

Vol. 12, No. 3, P. 55

Interferences among geostationary satellites determine allocations. Spectrum/Orbit Utilization Program (SOUP) is analytical computer program for determining mutual interferences among geostationary-satellite communication systems operating in given scenario. Major computed outputs are carrier-to-interference ratios at receivers at specified stations on Earth. Information enables determination of acceptability of planned communication systems. Written in FORTRAN.

B88-10215**NONINTERLACED-TO-INTERLACED TELEVISION-SCAN CONVERTER**

SERGIO MORALES (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16777**Vol. 12, No. 4, P. 22**

Computer text and ordinary images displayed together without text jitter. Scan converter enables superposition of alphanumeric text generated by computer-driven video generator on National Television System Committee (NTSC) standard interlaced-scan image. Made of commercially available integrated circuits and operates in conjunction with NTSC synchronizing-signal generator. Standard television picture transmitted in two interlaced fields. Without scan converter, text image moves up and down by one line as fields change. With scan converter, text image stands still.

B88-10216**VLSI ARCHITECTURE OF A BINARY UP/DOWN COUNTER**

IN-SHEK HSU (Caltech), TRIEU-KIE TRUONG (Caltech), and I. S. REED (University of Southern California)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17205**Vol. 12, No. 4, P. 24**

Identical stages contain relatively-few logic gates. New algorithm simplifies design of binary up/down counter. Design suitable for very-large-scale integrated circuits. Contains simple 'pipeline' array of identical cells. Programmable logic unit converts increment and decrement input signals to 'U' and 'D' signals required by algorithm of counter.

B88-10217**CANCELING ELECTROMAGNETIC INTERFERENCE DURING TESTS**

PAUL A. ROBINSON, JR. (Caltech), and LARRY D. EDMONDS (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17132**Vol. 12, No. 4, P. 26**

Old technique solves modern problem. Simple amplitude-and-phase-cancellation technique removes strong electromagnetic interference from received test signal, enabling recovery of relatively weak signal from device under test. Useful in outdoor tests of devices for electromagnetic compatibility.

B88-10218**DEVELOPMENT OF A DIGITAL FLIGHT-CONTROL SYSTEM**

G. ALLAN SMITH, and GEORGE MEYER

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11778**Vol. 12, No. 4, P. 28**

Feed-forward control path includes inversion of model of the aircraft. Report describes concept, development, tests of digital flight-control system for vertical-attitude-takeoff-and-landing aircraft. System based in airborne digital computer. Combines control of attitude and thrust in unified system for operation over full coupled ranges of velocity, altitude, attitude, and acceleration.

B88-10270**MOBILE COMMUNICATION VIA SATELLITE**

TSUN-YEE YAN (Caltech), and FIROUZ M. NADERI (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17041**Vol. 12, No. 5, P. 26**

System mixes real-time and delayed-transmission channels. Combination of L-band and SHF links connect fixed and mobile equipment on ground to satellite relay. Software and hardware architecture conforms structure of open-system-interconnection model suggested by International Standards Organization.

B88-10271**ANALOG SENSOR OF LARGE-AMPLITUDE DISPLACEMENTS**

ROBERT MISERENTINO, and WILLIAM C. WHITE (Wyle Laboratories)

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13731**Vol. 12, No. 5, P. 28**

Noninvasive device measures large amplitudes at low frequencies. Low-angle, light-sensitive system tracks moving leading edge of model. Applications include opening and closing of automatic doors as far and fast as needed.

B88-10272**WIDEBAND DIGITAL INTERFACE UNIT**

WILLIAM M. BALTAU (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17276**Vol. 12, No. 5, P. 30**

Signals converted from serial to parallel and buffered for input to computer. Wideband digital interface unit converts serial input data bits to 16-bit words and feeds them as needed to host computer.

B88-10273**FAST DATA ACQUISITION FOR MASS SPECTROMETER**

K. A. LINCOLN, and R. D. BECHTEL (Santa Clara University)

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-24538)

ARC-11785**Vol. 12, No. 5, P. 32**

New equipment has speed and capacity to process time-of-flight data. System relies on fast, compact waveform digitizer with 32-k memory coupled to personal computer. With digitizer, system captures all mass peaks on each 25- to 35-microseconds cycle of spectrometer.

B88-10274**SINGLE-CHIP VLSI REED-SOLOMON DECODER**

HOWARD M. SHAO (Caltech), TRIEU-KIE TRUONG (Caltech), IN-SHEK HSU (Caltech), and LESLIE J. DEUTSCH (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16854**Vol. 12, No. 5, P. 36**

Efficient utilization of computing elements reduces size while preserving throughput. VLSI architecture is pipeline Reed-Solomon decoder for correction of errors and erasures. Uses transform circuit to compute syndrome polynomial. Erasure information enters decoder as binary sequence. Applied to variety of digital communications involving error-correcting RS codes.

B88-10275**MERGING DIGITAL DATA WITH A VIDEO SIGNAL**

THOMAS J. COLLINS, III (Technology, Inc.), WILLIAM G. CROSIER (Technology, Inc.), and WILLIAM H. PALOSKI (Technology, Inc.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21248**Vol. 12, No. 5, P. 38**

Data displayed on television image of experiment. Video images

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of experiment sent with digital data on experiment to remote station. Digital data raw and unformatted or in form of characters. For minimal power consumption, interface circuit built of CMOS and HMOS integrated-circuit chips. Buffer/decoder circuit enables experiment computer to communicate with board without excessive loading of computer bus by board. Memory multiplexer/memory array implements buffer-swapping scheme as one buffer is read, other filled with new data.

B88-10276

INTEGRATED DISPLAYS FOR HELICOPTER PILOTS

HARRY N. SWENSON, CLYDE H. PAULK, JR., ROBERT L. KILMER (IBM Corp.), and FRANK J. KILMER (IBM Corp.)
May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-31551)

ARC-11699

Vol. 12, No. 5, P. 39

Report evaluates three similar video displays for guidance of helicopter pilots in low-level flight at night in adverse weather. Computer produces guidance information for pilot by integrating data from terrain-following radar, forward-looking infrared (FLIR) imagery, and data from such autonomous navigation instruments as inertial navigation systems and Doppler radar. FLIR imagery, information on status of helicopter, and command symbols incorporated in one head-down display.

B88-10277

RESEARCH ON THE CH-47B HELICOPTER

KATHRYN B. HILBERT, GEORGE E. TUCKER, ROBERT T. N. CHEN, EMMETT B. FRY, and WILLIAM S. HINDSON (Stanford University)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11759

Vol. 12, No. 5, P. 39

Report describes equipment added to, and research capabilities of CH-47B helicopter. Programmable symbol generator provides display formats for variety of missions - those of vertical-takeoff-and-landing aircraft and helicopters. Powerful general-purpose flight computer in operation. Computer programmable in high-level languages and supports research more efficiently. Flight-control software developed to improve capability of helicopter to perform simulations in flight.

B88-10330

PREVENTING ARC WELDING FROM DAMAGING ELECTRONICS

NOEL SARGENT, and D. MAREEN (General Dynamics Corp.)

Jun. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14480

Vol. 12, No. 6, P. 48

Shielding technique developed to protect sensitive electronic equipment from damage due to electromagnetic disturbances produced by arc welding. Established acceptable alternative in instances in which electronic equipment cannot be removed prior to arc welding. Guidelines established for open, unshielded welds. Procedure applicable to robotics or computer-aided manufacturing.

B88-10331

SYSTEM MEASURES LOGIC-GATE DELAYS

BRENT R. BLAES (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16646

Vol. 12, No. 6, P. 48

Many gates on chip tested automatically. Automatic testing system measures signal-propagation delays of experimental integrated-circuit array of logic gates. Includes controlling computer, counter/time, and feedback-controlled timing-waveform generator.

Multiplexer included on integrated-circuit chip with logic-gate array to be tested. Delays measured by system serve as valuable data for design of fast logic and memory chips.

B88-10332

THERMAL REMOTE ANEMOMETER DEVICE

JOSEPH S. HEYMAN, D. MICHELE HEATH, WILLIAM P. WINFREE, WILLIAM E. MILLER, and CHRISTOPHER S. WELCH (College of William and Mary)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13508

Vol. 12, No. 6, P. 51

Thermal Remote Anemometer Device developed for remote, noncontacting, passive measurement of thermal properties of sample. Model heated locally by scanning laser beam and cooled by wind in tunnel. Thermal image of model analyzed to deduce pattern of airflow around model. For materials applications, system used for evaluation of thin films and determination of thermal diffusivity and adhesive-layer contact. For medical applications, measures perfusion through skin to characterize blood flow and used to determine viabilities of grafts and to characterize tissues.

B88-10333

DESIGNING ESTIMATOR/PREDICTOR DIGITAL PHASE-LOCKED LOOPS

J. I. STATMAN (Caltech), and W. J. HURD (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17196

Vol. 12, No. 6, P. 52

Signal delays in equipment compensated automatically. New approach to design of digital phase-locked loop (DPLL) incorporates concepts from estimation theory and involves decomposition of closed-loop transfer function into estimator and predictor. Estimator provides recursive estimates of phase, frequency, and higher order derivatives of phase with respect to time, while predictor compensates for delay, called 'transport lag,' caused by PLL equipment and by DPLL computations.

B88-10334

INTERVAL COUNTER MEASURES STABILITY OF FREQUENCY

C. A. GREENHALL (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17325

Vol. 12, No. 6, P. 55

Propagation of errors and effects of dead time suppressed. System includes precise timing-pulse generator with interval counter and suitably programmed computer determines relative stability or instability of frequency of two signals differing in frequency by about 1 Hz. Designed for use in frequency-standards laboratory.

B88-10335

CONSISTENT DATA DISTRIBUTION OVER OPTICAL LINKS

DANIEL L. PALUMBO

Jun. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13672

Vol. 12, No. 6, P. 56

Fiber optics combined with IDE's provide consistent data communication between fault-tolerant computers. Data-transmission-checking system designed to provide consistent and reliable data communications for fault-tolerant and highly reliable computers. New technique performs variant of algorithm for fault-tolerant computers and uses fiber optics and independent decision elements (IDE's) to require fewer processors and fewer transmissions of messages. Enables fault-tolerant computers

operating at different levels of redundancy to communicate with each other over triply redundant bus. Level of redundancy limited only by maximum number of wavelengths active on bus.

B88-10336**SYNCHRONOUS BOXCAR AVERAGER**

THOMAS W. ROGERS (United Technologies Corp.)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28223

Vol. 12, No. 6, P. 57

Digital electronic filtering system produces series of moving-average samples of fluctuating signal in manner resulting in removal of undesired periodic signal component of known frequency. Filter designed to pass steady or slowly varying components of fluctuating pressure, flow, pump speed, and pump torque in slurry-pumping system. Concept useful for monitoring or control in variety of applications including machinery, power supplies, and scientific instrumentation.

B88-10337**SYNCHRONIZATION SCHEME FOR PPM COMMUNICATION**

WILLIAM K. MARSHALL (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17033

Vol. 12, No. 6, P. 58

Synchronization achieved under difficult, low-signal conditions. Synchronization scheme for pulse-position modulation (PPM) matches pulse, word, and frame timeslots of receiver to received signals to ensure proper identification of received pulses. Involves brief sequence of synchronizing pulses within each transmitted frame and relies on periodic repetition of synchronizing pulses for verification. Use of verification reduces number of synchronizing pulses required but increases time required to achieve synchronization.

B88-10338**SIMULATION OF SATELLITE IMAGERY FROM AERIAL IMAGERY**

CHRISTINE A. HLAVKA

Jun. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-20934)

ARC-11714

Vol. 12, No. 6, P. 60

High-resolution-image data convolved with point-spread function. Report describes use of higher-resolution-image data from aerial photographs or electronic scans of ground to simulate lower resolution images obtained if same area of ground viewed from imaging system in orbit. Simulation technique helpful in analysis of data received from operating satellites and in design of future satellite-borne imaging systems.

B88-10339**NONDYNAMIC TRACKING USING THE GLOBAL POSITIONING SYSTEM**

T. P. YUNCK (Caltech), and SIEN-CHONG WU (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16926

Vol. 12, No. 6, P. 60

Report describes technique for using Global Positioning System (GPS) to determine position of low Earth orbiter without need for dynamic models. Differential observing strategy requires GPS receiver on user vehicle and network of six ground receivers. Computationally efficient technique delivers decimeter accuracy on orbits down to lowest altitudes. New technique nondynamic long-arc strategy having potential for accuracy of best dynamic techniques

while retaining much of computational simplicity of geometric techniques.

B88-10340**THE MARK III VLBI SYSTEM**

A. E. E. ROGERS (NEROC Haystack Observatory), A. R. WHITNEY (NEROC Haystack Observatory), J. I. LEVINE (NEROC Haystack Observatory), E. F. NESMAN (NEROC Haystack Observatory), J. C. WEBBER (NEROC Haystack Observatory), and H. F. HINTEREGGER (NEROC Haystack Observatory)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13028

Vol. 12, No. 6, P. 62

Geodetic measurements have errors in centimeter range. Collection of three reports describes both equipment and results of some measurements taken with Mark III very-long-baseline interferometry (VLBI) system. Has demonstrated high accuracy over short baselines, where phase-delay measurements used. Advanced hardware, called Mark III A, developed to improve system performance and efficiency. Original Mark III hardware and III A subsystem upgrades developed as part of NASA Crustal Dynamics Project at Haystack Observatory.

B88-10341**ADAPTIVE CONTROL FOR SPACE-STATION JOINTS**

CHE-HANG CHARLES IH (Caltech), DAVID S. BAYARD (Caltech), and SHYH JONG WANG (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17063

Vol. 12, No. 6, P. 63

Input gain weighting added to existing adaptive-control algorithm. Report discusses concept for adaptive control of rotations of various appended structures about joints on space station, with suppression of vibrations in both station and appendages. Concept relevant to such terrestrial applications as control of aircraft, suppression of vibrations in large buildings, and robotics.

B88-10342**TESTS OF HELICOPTER CONTROL SYSTEM**

KATHRYN B. HILBERT, J. VICTOR LEBACQZ, and WILLIAM S. HINDSON (Stanford University)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11761

Vol. 12, No. 6, P. 64

Advanced control systems being developed for rotorcraft. Report discusses aspects of development of multivariable, explicit-model-following control system for CH-47B fly-by-wire helicopter. Project part of recent trend toward use of highly-augmented, high-gain flight-control systems to assist pilots of military helicopters in performance of demanding tasks and to improve handling qualities of aircraft.

B88-10365**PROGRAMMABLE DATA FORMATTER**

ROBERT E. MARTIN

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13104

Vol. 12, No. 7, P. 32

System adapts data in diverse formats for transmission. Microprocessor controls complex activities of data formatting, error checking, and transmission-priority arbitration. System developed for formatting signals from and to telemetry units on spacecraft for widespread telecommunication network.

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B88-10366

FAST SYNCHRONIZATION WITH BURST-MODE DIGITAL SIGNALS

LIN-NAN LEE (Comsat Laboratories), AJIT SHENOY (Comsat Laboratories), and MICHAEL KITMING ENG (Comsat Laboratories)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16925

Vol. 12, No. 7, P. 33

Oscillator quickly synchronized with data clock. Sampling clock synchronized with sinusoid by feedback technique. Signal is measure of phase-error angle theta and generated digitally by technique related to calculation of theta from periodic samples of sinusoid.

B88-10367

ADAPTIVE RECEIVER FOR CODED COMMUNICATIONS

U. A. VON DER EMBSE (Hughes Aircraft Co.)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11815

Vol. 12, No. 7, P. 34

Acquisition and tracking of signal controlled automatically. Receiver constructed in analog and digital portions so signal-processing functions performed economically by digital micro-processors. Principal feature is adaptive control algorithm that guides acquisition tracking and demodulation of signal providing for orderly transition through several sequences of operating modes.

B88-10368

SIMULATING INSTRUMENT HELICOPTER TAKEOFFS AND LANDINGS

ANIL V. PHATAK, and JOHN A. SORENSEN

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-28931)

ARC-11813

Vol. 12, No. 7, P. 36

Advantages and disadvantages of computer-based simulations reviewed. Report reviews current methods for evaluation of TERP's. Discusses feasibility, benefits, liabilities of substitution of electronically controlled flight-simulation equipment for flight tests.

B88-10369

SYNCHRONOUS VERSUS ASYNCHRONOUS FLIGHT CONTROL

VICTORIA A. REGENIE, CLAUDE V. CHACON, and WILTON P. LOCK

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-29866)

ARC-11799

Vol. 12, No. 7, P. 36

Both types of digital systems evaluated in flight and on ground. Evaluates four different systems by such criteria as software reliability, cost increases, and schedule delays.

B88-10370

FAULT-TOLERANT SOFTWARE FOR FLIGHT CONTROL

DWAIN A. DEETS, WILTON P. LOCK, and VINCENT A. MEGNA (Charles Stark Draper Laboratory)

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-19325)

ARC-11763

Vol. 12, No. 7, P. 37

Report discusses design and testing of redundant control system for F-8 digital fly-by-wire airplane. Outstanding feature of system is fault-tolerant software (REBUS) residing in primary digital computers. Transition to operation on backup software smooth.

B88-10371

GPS SATELLITE MULTIPATH RANGE ERRORS

LAWRENCE E. YOUNG (Caltech)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17020

Vol. 12, No. 7, P. 38

Report discusses errors in range measurements in GPS system due to multipath transmissions originating at satellites. Large uncertainties in sizes of multipath errors limit precision of GPS measurements. Experiments proposed to determine systematic multipath errors under various operating conditions.

B88-10403

ASYNCHRONOUS COMMUNICATION SCHEME FOR HYPERCUBE COMPUTER

HERB S. MADAN (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16860

Vol. 12, No. 8, P. 31

Scheme devised for asynchronous-message communication system for Mark III hypercube concurrent-processor network. Network consists of up to 1,024 processing elements connected electrically as though were at corners of 10-dimensional cube. Each node contains two Motorola 68020 processors along with Motorola 68881 floating-point processor utilizing up to 4 megabytes of shared dynamic random-access memory. Scheme intended to support applications requiring passage of both polled or solicited and unsolicited messages.

B88-10404

FORCE-BALANCE DYNAMIC DISPLAY

ALICE T. FERRIS, and WILLIAM C. WHITE (Wyle Laboratories)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13658

Vol. 12, No. 8, P. 32

Balance dynamic display unit (BDDU) is compact system conditioning six dynamic analog signals so they are monitored simultaneously in real time on single-trace oscilloscope. Typical BDDU oscilloscope display in scan mode shows each channel occupying one-sixth of total trace. System features two display modes usable with conventional, single-channel oscilloscope: multiplexed six-channel 'bar-graph' format and single-channel display. Two-stage visual and audible limit alarm provided for each channel.

B88-10405

HIGH-SPEED MULTIPROCESSING FOR ENGINE SIMULATION

EDWARD J. MILNER, and DALE J. ARPASI

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-16221)

LEW-14593

Vol. 12, No. 8, P. 32

Parallel microprocessors have computational power and speed for realistic simulations. Interactive information bus links front-end processor and computational processors. Real-time information bus links real-time extension processor and pre-processors. Computational processor and preprocessor communicate through shared memory. System used to simulate small turboshaft engine to demonstrate potential of multiprocessing in such applications. Real-time simulations aid development of new digital engine controls enabling testing of hardware and software under realistic conditions.

B88-10406

SIMULATING LINE-OF-SIGHT RADAR RETURNS

F. J. MORAN, and J. D. PHILLIPS

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-12967)

ARC-11783 Vol. 12, No. 8, P. 36

Computational method developed to model return signals of ground-mapping radar system for use in simulations where terrain is polygonal form commonly used with computer-generated imagery (CGI). Approach involves fast rejection of polygons not visible to radar return. Technique used to determine which objects in scene visible from specified vantage point and also to determine movements of robot arms avoiding obstacles. Test circles used in algorithm quickly rejects terrain features not traversed by radar line of sight. If circle does not cross line of sight, then all mountains in it rejected.

B88-10407

PHASE-LENGTH OPTICAL PHASE-LOCKED-LOOP SENSOR (PLOPS)

JOSEPH S. HEYMAN, and ROBERT S. ROGAWSKI

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13387 Vol. 12, No. 8, P. 38

PLOPS system designed to provide high-resolution measurement of change in optical length from optical-system source to any optical reflector, including diffuse reflector. Serves as adjustable optical ruler, providing high resolution in measurements of small and large changes in distance to target. Use is broad and includes most measurement situations requiring information on length, vibration, and their derivatives. Applications include building dynamics, remote sensing of vibrations in such systems as turbine-based machinery, monitoring of structural dynamics, noncontacting sensing of surface contours, measurement of large strains as in earthquake monitoring, measurement of atmospheric dynamics and turbulence, high-resolution sensing of humidity, detection of surface acoustic waves by optical microscopy, and related areas.

B88-10408

MICROCOMPUTER BOARD FOR SPACE SHUTTLE PAYLOADS

MITCHELL L. DAVIS

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13143 Vol. 12, No. 8, P. 40

Report describes Space Flight 80C86 microcomputer board, a configurable general-purpose microcomputer board designed specifically for near-Earth space-flight applications. Architecture of microcomputer board supports dual-bus structure. Local bus provides essential elements for stand-alone computer operations, and system bus provides for communication with subsystems unique to specific application.

B88-10461

NONCONTACTING INSPECTION HEADS FOR ROBOTS

SARKIS BARKHOUDARIAN (Rockwell International Corp.)

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29292 Vol. 12, No. 9, P. 36

Compact assembly for hand of robot includes group of sensors to monitor internal conditions of such complex equipment as turbines, pumps, motors, and generators. Inspection head includes sensors; for example, pyrometers, isotope wear analyzers, spectrometers, and interferometers. Conditions as overheating of turbines, wear of ball bearings and seals, erosion of blades and impellers, leakage of joints, and deformations of housings, monitored without disassembly or shutdown. Used in typical robot applications.

B88-10462

RADIO-FREQUENCY STRAIN MONITOR

JOSEPH S. HEYMAN, ROBERT S. ROGOWSKI, and MILFORD S. HOLBEN, JR. (PRC Kentron, Inc.)

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13705 Vol. 12, No. 9, P. 36

Radio-frequency (RF) strain monitor developed to measure lengths of objects. RF waveguide or cable bonded to structure monitored. Propagation of RF signal along waveguide results in phase shift proportional to length of path traveled. Impedance mismatches placed in RF cable at nodes of structure. Records mismatches and detects overall length of line and lengths of intervals between nodes. Used to detect changes in elements of large structure with single cable. Monitor has potential for many applications, including monitoring stability of such large structures as aircraft, bridges, and buildings in Earthquake zones.

B88-10463

TOPOGRAPHICAL MAPPING WITH SYNTHETIC-APERTURE RADAR

HOWARD A. ZEBKER (Caltech), and RICHARD M. GOLDSTEIN (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16665 Vol. 12, No. 9, P. 39

Interferometric side-looking synthetic-aperture radar shows promise for high-resolution topographical mapping of terrain. Airplane carries two radar antennas. Radar signal transmitted by right antenna, reflected from ground received by both antennas. Amplitudes and phases of received signals recorded and processed separately to yield two 10-m-resolution amplitude-and-phase images of illuminated terrain. Two images mathematically combined point by point to obtain signal image containing interference fringes: phase at each location of image is difference between phases in two signals and amplitude at each location is project of amplitudes of two signals. Theoretically, technique has potential to attain a root-mean-square (rms) altitude error as small as 2 m.

B88-10464

SONIC SIMULATION OF NEAR PROJECTILE HITS

J. I. STATMAN (Caltech), and E. R. RODEMICH (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16943 Vol. 12, No. 9, P. 40

Measured frequencies identify projectiles and indicate miss distances. Developmental battlefield-simulation system for training soldiers uses sounds emitted by incoming projectiles to identify projectiles and indicate miss distances. Depending on projectile type and closeness of each hit, system generates 'kill' or 'near-kill' indication. Artillery shell simulated by lightweight plastic projectile launched by compressed air. Flow of air through groove in nose of projectile generates acoustic tone. Each participant carries audio receiver measure and process tone signal. System performs fast Fourier transforms of received tone to obtain dominant frequency during each succeeding interval of approximately 40 ms (an interval determined from practical signal-processing requirements). With modifications, system concept applicable to collision-warning or collision-avoidance systems.

B88-10465

ANALOG/DIGITAL SYSTEM FOR GERMANIUM THERMOMETER

CHRISTOPHER WOODHOUSE

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13149 Vol. 12, No. 9, P. 40

Electronic system containing analog and digital circuits makes

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high-precision, four-wire measurements of resistance of each germanium resistance thermometer (GRT) in array of devices, using alternating current (ac) of 1 micro-A. At end measurement interval, contents of negative register subtracted from positive one, resulting in very-narrow-band synchronous demodulation of carrier wave and suppression of out-of-band noise. Microprocessor free to perform other duties after measurement complete. Useful in noisy terrestrial environments encountered in factories.

B88-10466

FAULT-TOLERANT LOCAL-AREA NETWORK

SERGIO MORALES (Caltech), and GARY L. FRIEDMAN (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16949

Vol. 12, No. 9, P. 41

Local-area network (LAN) for computers prevents single-point failure from interrupting communication between nodes of network. Includes two complete cables, LAN 1 and LAN 2. Microprocessor-based slave switches link cables to network-node devices as work stations, print servers, and file servers. Slave switches respond to commands from master switch, connecting nodes to two cable networks or disconnecting them so they are completely isolated. System monitor and control computer (SMC) acts as gateway, allowing nodes on either cable to communicate with each other and ensuring that LAN 1 and LAN 2 are fully used when functioning properly. Network monitors and controls itself, automatically routes traffic for efficient use of resources, and isolates and corrects its own faults, with potential dramatic reduction in time out of service.

B88-10467

TWO-DIMENSIONAL SYSTOLIC ARRAY FOR KALMAN-FILTER COMPUTING

JAW JOHN CHANG (Caltech), and HEN-GEUL YEH (California State University)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17108

Vol. 12, No. 9, P. 42

Two-dimensional, systolic-array, parallel data processor performs Kalman filtering in real time. Algorithm rearranged to be Faddeev algorithm for generalized signal processing. Algorithm mapped onto very-large-scale integrated-circuit (VLSI) chip in two-dimensional, regular, simple, expandable array of concurrent processing cells. Processor does matrix/vector-based algebraic computations. Applications include adaptive control of robots, remote manipulators and flexible structures and processing radar signals to track targets.

B88-10468

QUANTILE VOCODER

KUMAR SWAMINATHAN (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16829

Vol. 12, No. 9, P. 43

Parameters of spectral envelope obtained statistically. Algorithm for digital compression of speech signals encodes power spectral density of each short interval of speech by use of quantiles or order statistics. Purpose to reduce bit rate and bandwidth required for transmission. When fully developed, quantile vocoder - speech-encoding system based on new algorithm - expected moderately complicated compared with other speech-encoding systems and reproduce high-quality speech from code transmitted at relatively low bit rates. Speech signal treated mathematically as though amplitude spectrum stationary during short coding intervals, called 'windows'. Window duration of 20 or 35 ms, chosen as compromise between frequency resolution and time resolution.

During each window, short-time amplitude and power spectra found by sampling at high rate (typically 10 kHz) and taking fast Fourier transforms (FFT's).

B88-10469

OPTICAL RECOGNITION AND TRACKING OF OBJECTS

TIEN-HSIN CHAO (Caltech), and HUA-KUANG LIU (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17139

Vol. 12, No. 9, P. 44

Separate objects moving independently tracked simultaneously. System uses coherent optical techniques to obtain correlation between each object and reference image. Moving objects monitored by charge-coupled-device television camera, output fed to liquid-crystal television (LCTV) display. Acting as spatial light modulator, LCTV impresses images of moving objects on collimated laser beam. Beam spatially low-pass filtered to remove high-spatial-frequency television grid pattern.

B88-10470

RAIN-MAPPING RADAR

K. E. IM (Caltech), F. K. LI (Caltech), W. J. WILSON (Caltech), and D. ROSING (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17248

Vol. 12, No. 9, P. 46

Orbiting radar system measures rates of rainfall from 0.5 to 60 mm/h. Radar waves scattered and absorbed by rainfall to extents depending on wavelength, polarization, rate of rainfall, and distribution of sizes and shapes of raindrops. Backscattered radar signal as function of length of path through rain used to infer detailed information about rain. Accumulated radar return signals processed into global maps of monthly average rainfall for use in climatological studies.

B88-10471

SYSTEM TURNS SAR IMAGES INTO MAPS

J. C. CURLANDER (Caltech), RONALD KWOK (Caltech), and SHIRLEY S. N. PANG (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17106

Vol. 12, No. 9, P. 47

Postprocessing system for synthetic-aperture radar (SAR) transforms raw images from natural rotated and distorted SAR reference frame into geocoded images. Images automatically corrected to remove slant-range nonlinearities and Doppler skew. Produces multiple-frame mosaics for large-scale mapping. Does not require tedious manual registration of representative 'tie' points in raw SAR imagery with known locations on Earth.

B88-10472

CLOSED-LOOP OPTICAL ROTATION SENSOR

WILLIS C. GOSS (Caltech), BRUCE R. YOUNG (Caltech), NOBLE M. NERHEIM (Caltech), and RANDALL K. BARTMAN (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16558

Vol. 12, No. 9, P. 48

Optical/electronic system senses rotation and emits pulses at angular increments. System provides linear scale factor across wide range of rotation rates with no lockup at null. Design needs analog-to-digital converters with elaborate signal-processing circuits. Light from laser diode split evenly into two beams propagating in opposite directions around rotation-sensing coil of

optical-fiber waveguide. Beams acquire phase difference proportional to rotation rate as they pass through coil. After emerging from coil, beams recombine in beam splitter, and coherent sum led to photodiode.

B88-10516**AIRPLANE TAKEOFF-AND-LANDING PERFORMANCE MONITORING SYSTEM**

DAVID B. MIDDLETON, LEE H. PERSON, JR., and RAGHAVACHARI SRIVATSAN (University of Kansas)
Nov. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-31591 and N87-20264)

LAR-13734**Vol. 12, No. 10, P. 36**

Airplane Takeoff-and-Landing Performance Monitoring System (TOPMS) designed to increase safety during takeoffs and landings of aircraft. Provides pilots with graphic information crucial to decision to continue or reject takeoff. If rejected or landing in progress, provides crucial information relative to where airplane can be brought to stop.

B88-10517**ANALYZING PULSE-CODE MODULATION ON A SMALL COMPUTER**

DAVID E. MASSEY

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13170**Vol. 12, No. 10, P. 36**

System for analysis pulse-code modulation (PCM) comprises personal computer, computer program, and peripheral interface adapter on circuit board that plugs into expansion bus of computer. Functions essentially as 'snapshot' PCM decommutator, which accepts and stores thousands of frames of PCM data, sifts through them repeatedly to process according to routines specified by operator. Enables faster testing and involves less equipment than older testing systems.

B88-10518**SELF-TESTING COMPUTER MEMORY**

SAVIO CHAU, N. (Caltech), and DAVID A. RENNELS (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16850**Vol. 12, No. 10, P. 40**

Memory system for computer repeatedly tests itself during brief, regular interruptions of normal processing of data. Detects and corrects transient faults as single-event upsets (changes in bits due to ionizing radiation) within milliseconds after occurring. Self-testing concept surpasses conventional by actively flushing latent defects out of memory and attempting to correct before accumulating beyond capacity for self-correction or detection. Cost of improvement modest increase in complexity of circuitry and operating time.

B88-10565**HIGH-CAPACITY AERONAUTICAL SATELLITE COMMUNICATION SYSTEM**

M. K. SUE (Caltech), F. DAVARIAN (Caltech), and H. W. CHAN (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17234**Vol. 12, No. 11, P. 30**

System primarily designed to serve aircraft en route. Provides 5,093 forward communication channels and 7,093 reverse channels. This allocation of forward and reverse channels reflects anticipated communication traffic patterns. East and west satellites

relay messages from ground to airplanes and from airplanes to ground. Use of two satellites instead of one increases availability of services and reliability of system.

B88-10566**SYNTHETIC-APERTURE RADAR PROCESSOR FOR LARGE DRIFT ANGLE**

YUN-LING LOU (Caltech), HOWARD A. ZEBKER (Caltech), QUYEN DINH NGUYEN (Caltech), and MICHAEL Y. JIN (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17238**Vol. 12, No. 11, P. 32**

Digital signal-processing system makes images of terrain from synthetic-aperture-radar returns to airplane flying at large drift angle. Output of system includes high-resolution images, four-look images, magnitude/phase-difference images, and 'compressed,' all-inclusive data sets. Magnitude/phase-difference images produced by correlating images of like polarizations. Useful for investigating phase characteristics of targets in different polarizations.

B88-10567**SHIFTING OF IMAGE FIELDS FOR BETTER STEREOSCOPIC TV IMAGES**

DANIEL B. DINER (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17249**Vol. 12, No. 11, P. 34**

Concept for shifting horizontal positions of TV image fields of stereoscopic TV display reduces stereoscopic depth distorting while increasing stereoscopic depth resolution of images. Applicable to form of stereoscopic TV in which two views of scene presented by two video cameras to different fields of one monitor. According to concept, view of left camera shifts to left, and right camera, to right. Images made to overlap, so observed comfortably. Shifting done by inexpensive electronic circuitry.

B88-10568**RADAR DETECTS OCEAN SURFACE CURRENTS**

R. M. GOLDSTEIN (Caltech), and H. A. ZEBKER (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17192**Vol. 12, No. 11, P. 34**

Interferometric system uses reflections from ripples. Experimental airborne interferometric synthetic-aperture radar system measures line-of-sight component of velocity of ripples on surface of ocean. With help of suitable assumptions about relationships among ripples, larger waves or swells on which they occur, and overall movement of water, component of velocity of underlying surface current perpendicular to path of airplane deduced.

B88-10569**MICROWAVE DEFLECTION SENSOR**

PAUL SHORES, HERB KOBAYASHI, PHONG NGO, and C. L. LICHTENBERG

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20974**Vol. 12, No. 11, P. 36**

Doppler-radar instrument measures small deflections or vibrations of reflecting surface. Acting as interferometric micrometer, instrument includes combination of analog and digital circuits measuring change in phase of radar return due to movement of reflecting surface along signal-propagation path. Includes

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homodyne Doppler-radar transceiver and digital signal-processing circuitry to measure change in phase shift as target deflects.

B88-10570

NOISE PERFORMANCE OF A DIGITAL TANLOCK LOOP

W. J. HURD (Caltech), and C. A. POMALAZA-RAEZ (Caltech)
Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16960

Vol. 12, No. 11, P. 38

Slight improvement over sinusoidal phase-lock loop achieved. Report discusses theoretical studies and numerical simulations of performance of digital tangent phase-lock loop (DTL), in presence of noise.

B88-10571

RADAR-DATA-PROCESSING SYSTEM

KARL F. ANDERSON, JOHN W. WRIN, and ROBERT JAMES (GMD Systems)
Dec. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-29884)

ARC-11782

Vol. 12, No. 11, P. 39

Report describes radar data system at NASA Western Aeronautical Test Range. System provides real-time and recorded data about flightpaths of research aircraft and Space Shuttle. Called RADATS, processes data from three radars simultaneously; interacts with system operator; enhances data by introducing corrections and smoothing; controls range, azimuth, and elevation of radars; and automatically calibrates itself before and after missions. Software classified into three kinds of programs: utility, real-time, and calibration. Equipment exhibited exceptional reliability. Software matured to become virtually trouble-free.

B88-10572

APPROXIMATIONS FOR CONTROLS OF HEREDITARY SYSTEMS

MARK H. MILMAN (Caltech)
Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17222

Vol. 12, No. 11, P. 40

Convergence properties of controls, trajectories, and feedback kernels analyzed. Report discusses use of factorization techniques to approximate optimal feedback gains in finite-time, linear-regulator/quadratic-cost-function problem of system governed by retarded-functional-difference equations RFDE's with control delays. Presents approach to factorization based on discretization of state penalty leading to simple structure for feedback control law.

B88-10573

REPEATED TRANSMISSIONS IN MOBILE/SATELLITE COMMUNICATIONS

TSUN-YEE YAN (Caltech), and LOREN P. CLARE (Caltech)
Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16705

Vol. 12, No. 11, P. 41

Repetition increases throughput and decreases delay. Paper discusses theoretical performance of communication system for land-mobile stations with satellite relay using ALOHA random-access protocol modified for repeated transmissions. Methods and conclusions contribute to general understanding of packet communications in fading channels.

B89-10013

PROCESSING SAR IMAGES ON BOARD

KUANG Y. LIU (Caltech), and WAYNE E. ARENS (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17195

Vol. 13, No. 1, P. 29

Synthetic-aperture radar (SAR) processor operates aboard moving radar platform, turning raw signal data into images of scanned terrain. In conventional SAR systems, raw data either transmitted to stations on ground or recorded on magnetic tape by high-density digital recorders for subsequent processing on ground. Advantages include making SAR images available immediately and processed data transmitted or recorded only one-fifth as voluminous as raw data. Onboard image compression reduces volume of data even further.

B89-10014

TERRAIN-FOLLOWING/TERRAIN-AVOIDANCE SYSTEM FOR HELICOPTERS

DAN W. DORR

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20982)

ARC-11731

Vol. 13, No. 1, P. 30

Report describes early stages of development of control system enabling helicopter to follow automatically contours of terrain below and avoid collisions with terrain. Focuses on optimization of algorithm for generation of flightpath with respect to several variables, development of controller to position helicopter precisely along terrain-following/terrain-avoidance (TF/TA) flightpath, and integration of flightpath-trajectory software with flightpath-control software.

B89-10015

DESIGN AND ANALYSIS OF OPTICAL COMMUNICATION LINKS

J. R. LESH (Caltech), W. K. MARSHALL (Caltech), and J. KATZ (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17017

Vol. 13, No. 1, P. 31

To convey to prospective designers intuitive understanding based on unique characteristics of optical communication systems, report presents method of design and analysis of outer-space optical communication link using pulse-position modulation (PPM) and in which received signal sufficiently weak to require detection by photomultiplier operating in photon-counting mode. Step 1 requires some knowledge or assumptions about parameters of transmitter and receiver. Step 2 determination of average number of background-noise photons detected during PPM timeslot. Step 3 average number, P_s of signal photons detected per signal pulse compared with average number, P_n of noise pulses detected per PPM timeslot.

B89-10016

PHOTOVOLTAIC GENERATION OF POWER BY UTILITIES

RUSSELL S. SUGIMURA (Caltech), and JOAN M. WOOD (Tennessee Valley Authority)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17091

Vol. 13, No. 1, P. 32

Bibliography of recent documents on photovoltaic generation of electric power divided into two subject areas: (1) central-station systems and (2) residential and intermediate systems. Further divided into design options, performance modeling, construction experience, operating experience, economics and costs, and integration with utilities. Reports, papers, and books included. Bibliography lists 79 references.

B89-10050**MULTIPLE-BEAM COMMUNICATIONS ANTENNA**

R. W. MYHRE, T. E. ROBERTS (Ford Aerospace and Communications Corp.), and W. C. WONG (TRW, Inc.)
 Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14190**Vol. 13, No. 2, P. 34**

System has both fixed-spot and scanning coverage. Advanced offset-fed spacecraft antenna systems operating in 30/20 GHz frequency bands developed to provide multiple-radiating fixed-spot and regional-coverage scanning beams for use on communications satellites. Operating at higher frequencies, provides alternate frequency bands for expansion of existing satellite services and achieving frequency reuse capability for conservation of frequency spectrum. 20-GHz transmitting antenna is offset-fed, dual-reflector configuration. 30-GHz receiving antenna has orthogonal polarized feeds, hyperbolic reflectors, and two subreflectors.

B89-10051**COMPUTER CONTROL FOR ION ENGINES**

JOHN R. BROPHY (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17292**Vol. 13, No. 2, P. 35**

Computer system controls start-up, steady-state operation, throttling, and shutdown of pair of xenon-ion propulsion engines. Controls direction of thrust of each engine through operation of gimbal stepping motors. Controls valves in propellant-storage and propellant-distribution system. Control software establishes and maintains efficient, stable operation over entire range of operating variables, and throttles engines to any point within range. Computer operates power supplies, valves, and flow controllers of two ion engines, ion-neutralizer subsystem, and other equipment. Designed for use in interplanetary flight, system adaptable to industrial use in ion-beam deposition of thin films.

B89-10052**DIGITAL, SATELLITE-BASED AERONAUTICAL COMMUNICATION**

F. DAVARIAN (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17252**Vol. 13, No. 2, P. 38**

Satellite system relays communication between aircraft and stations on ground. System offers better coverage with direct communication between air and ground, costs less and makes possible new communication services. Carries both voice and data. Because many data exchanged between aircraft and ground contain safety-related information, probability of bit errors essential.

B89-10054**SAMARA PROBE FOR REMOTE IMAGING**

JAMES D. BURKE (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17390**Vol. 13, No. 2, P. 42**

Imaging probe descends through atmosphere of planet, obtaining images of ground surface as it travels. Released from aircraft over Earth or from spacecraft over another planet. Body and single wing shaped like samara - winged seed like those of maple trees. Rotates as descends, providing panoramic view of terrain below. Radio image obtained by video camera to aircraft or spacecraft overhead.

B89-10055**VIDEO ALIGNMENT SYSTEM FOR REMOTE MANIPULATOR**

LEO G. MONFORD

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21372**Vol. 13, No. 2, P. 44**

Crosshairs and mirror provide angular references. Video system enables operator to align remote manipulator with objects grasped. System does not rely on aligning protuberances on objects. Possible to eliminate protuberances and mechanical interferences caused. Display on television monitor reveals orientation of television camera with respect to crosshairs on mirror on object with which camera aligned.

B89-10056**GRAY-SCALE PROCESSING FOR TRACKING OF WELDS**

DAVID A. GUTOW (Rockwell International Corp.)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29433**Vol. 13, No. 2, P. 44**

Digital analysis of video-image-processing system contributes to automation of weld-seam tracking. Makes no contact with seam. Small television camera views seam just ahead of point currently being welded. Arc provides illumination. Periodically frame grabber digitizes video image and stores in computer memory as gray-scale values. Seam located by analyzing Hough-transform arrays of derivatives of digitally-filtered image data. Information on location and orientation of seam used as feedback by welding robot to correct deviations of electrode from seam as welding continues.

B89-10057**DMSK RECEIVER FOR MOBILE/SATELLITE SERVICE**

FARAMAZ DAVARIAN (Caltech), MARVIN K. SIMON (Caltech), and JOE T. SUMIDA (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16659**Vol. 13, No. 2, P. 45**

Receiver for 2.4-kbit/s differential minimum-shift keying (DMSK) and Gaussian minimum-shift keying (GMSK) suitable for communication between land-mobile stations via geostationary satellites. Operating on phase-shifted signal in 800-MHz band, in presence of fading and Doppler frequency shifts, receiver compact, makes efficient use of frequency spectrum, and wastes little power. Receiver design implemented in very-large-scale-integrated circuits. Basic DMSK receiver design relies on baseband rather than intermediate-frequency processing of in-phase and quadrature signal components because phase errors due to differential delays smaller at baseband.

B89-10058**AUTOMATIC FREQUENCY CONTROL FOR DMSK RECEIVER**

FARAMAZ DAVARIAN (Caltech), and JOE T. SUMIDA (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17021**Vol. 13, No. 2, P. 47**

Report discusses performance of automatic frequency-control (AFC) subsystem of differential minimum-shift-keying receiver described in 'DMSK Receiver for Mobile/Satellite Service,' NPO-16659. Describes efforts to quantify behavior of system during acquisition of carrier signal; including theoretical analysis leading to numerical simulation, and measurements of performance of receiving equipment.

B89-10108**ADAPTIVE CONTROL OF REMOTE MANIPULATOR**

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HOMAYOUN SERAJI (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16922

Vol. 13, No. 3, P. 38

Robotic control system causes remote manipulator to follow closely reference trajectory in Cartesian reference frame in work space, without resort to computationally intensive mathematical model of robot dynamics and without knowledge of robot and load parameters. System, derived from linear multivariable theory, uses relatively simple feed forward and feedback controllers with model-reference adaptive control.

B89-10109

EIGHT-CHANNEL SPECTROMETER

STEVEN W. HUSTON (Rockwell International Corp.), and MILTON C. HENSLEY (Rockwell International Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29421

Vol. 13, No. 3, P. 40

Inexpensive, compact, battery-powered, eight-channel spectrometer produces 8-bit digital data in each channel and records data for subsequent reconstruction in analog form or for transmission to computer for analysis. Unit designed for use in analysis of rocket-exhaust plumes. Modified versions of spectrometer used to analyze combustion in boilers or gas turbines.

B89-10110

LIQUID-CRYSTAL OPTICAL CORRELATOR

HUA-KUANG LIU (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16750

Vol. 13, No. 3, P. 42

Optical correlator uses commercially-available liquid-crystal television (LCTV) screen as spatial light modulator. Correlations with this device done at video frame rates, making such operations as bar-code recognition possible at reasonable cost. With further development, such correlator useful in automation, robotic vision, and optical image processing.

B89-10111

OPTICAL RECEIVERS WITH ROUGH REFLECTORS

VICTOR A. VILNROTTER (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16664

Vol. 13, No. 3, P. 43

Receiver for optical communications uses rough reflector instead of diffraction-limited reflector customarily thought necessary for such systems. Rough reflector collects and focuses optical signal. Other receiver components include narrow-passband optical filter to reject out-of-band background radiation, spatial filter to limit receiver field of view, optical-detector array (typically two concentric detectors), and post detection processor to reconstruct transmitted message.

B89-10112

DIGITAL CONTROLLER FOR ACOUSTIC LEVITATION

D. KENT TARVER (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16623

Vol. 13, No. 3, P. 44

Acoustic driver digitally controls sound fields along three axes. Allows computerized acoustic levitation and manipulation of small objects for such purposes as containerless processing and

nuclear-fusion power experiments. Also used for controlling motion of vibration-testing tables in three dimensions.

B89-10113

TIMING SAMPLER FOR DELAY MEASUREMENTS

BRENT R. BLAES (Caltech), and MARTIN G. BUEHLER (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16645

Vol. 13, No. 3, P. 45

Integrated circuit called timing sampler used to measure delays in complementary metal oxide/silicon logic gates. Circuit chip contains chains of inverters and metal traces having minimum parasitic delays (delay chains), circuits to compare pulse timings, and output multiplexer. Timing sampler enables delay measurements for both positive and negative logic-level transitions by use of variety of circuit geometries representing tentative practical designs.

B89-10114

ACOUSTO-OPTICAL/MAGNETO-OPTICAL CORRELATOR OR CONVOLVER

HUA-KUANG LIU (Caltech), and JEFFREY A. DAVIS (San Diego State Univ.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17178

Vol. 13, No. 3, P. 46

Experimental system demonstrates optical processing of multiple channels of binary signals. One input channel contains signal that varies with time and applied to one-dimensional acousto-optical cell. Other input channel contains two-dimensional pattern that is stationary or can vary with time and applied to magneto-optical spatial light modulator. Output is time-varying correlation or convolution of first input with one of rows in second input.

B89-10115

DISCRETE-TIME MODEL-REFERENCE ADAPTIVE CONTROL

JOHN T. WEN (Caltech), DEIRDRE R. MELDRUM (Caltech), and MARK J. BALAS (Rensselaer Polytechnic Inst.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17062

Vol. 13, No. 3, P. 48

Paper discusses stability of digital model-reference adaptive control (MRAC) of robotic system or plant that operates at discrete time steps. Command-generator tracker (CGT) concept, originally proposed for continuous-time systems, is applied in discrete-time setting, enabling relaxation of some restrictive assumptions that guarantee stability of system controlled according to resulting algorithm. Likely applications include systems in which sensors and actuators not placed together.

B89-10116

COMBINING MICROWAVE FUNCTIONS TO REDUCE WEIGHT OF SPACECRAFT

BRYAN A. PALASZEWSKI (Caltech), and RICHARD M. DICKINSON (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16953

Vol. 13, No. 3, P. 48

Report discusses integration of sources of microwave power for microwave-arcjet propulsive systems and such microwave instruments as synthetic-aperture radar and radiometers in spacecraft. Integration essential feature of Combined Microwave

Science and Propulsion (COMAPP) concept, which incorporates new approach to design of spacecraft for exploration of planets. One of principal objectives in COMAPP to reduce overall weight of spacecraft and to maximize portion of weight devoted to scientific instrumentation.

B89-10160

SIGNAL PREPROCESSOR FOR LASER-FRINGE ANEMOMETERS

LAWRENCE G. OBERLE

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20516)

LEW-14663

Vol. 13, No. 4, P. 32

Signal-preprocessing unit contains digital and analog circuitry added to existing equipment in laser-fringe anemometer system to filter raw anemometer signal and relieve researcher of some tedious and difficult control functions. Preprocessor operates under control of same digital computer that acquires measurement data. Both automatically and in response to control settings applied manually by researcher, preprocessor helps system to establish conditions that produce signals of highest quality.

B89-10161

DIRECTIONAL HEARING AID

M. JHABVALA, and H. C. LIN (University of Maryland)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13027

Vol. 13, No. 4, P. 34

Hearing-aid device indicates visually whether sound is coming from left, right, back, or front. Device intended to assist individuals who are deaf in at least one ear and unable to discern naturally directions to sources of sound. Device promotes safety in street traffic, on loading docks, and in presence of sirens, alarms, and other warning sounds. Quadraphonic version of device built into pair of eyeglasses and binaural version built into visor.

B89-10162

SIMPLIFIED LINEAR MULTIVARIABLE CONTROL OF ROBOTS

HOMAYOUN SERAJI (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16857

Vol. 13, No. 4, P. 36

Simplified method developed to design control system that makes joints of robot follow reference trajectories. Generic design includes independent multivariable feedforward and feedback controllers. Feedforward controller based on inverse of linearized model of dynamics of robot and implements control law that contains only proportional and first and second derivatives of reference trajectories with respect to time. Feedback controller, which implements control law of proportional, first-derivative, and integral terms, makes tracking errors converge toward zero as time passes.

B89-10163

KEYBOARD EMULATION FOR COMPUTERIZED INSTRUMENTATION

P. M. WIEGAND (Michigan State Univ.), and S. R. CROUCH (Michigan State Univ.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14180

Vol. 13, No. 4, P. 37

Keyboard emulator has interface at same level as manual keyboard entry. Since communication and control take place at high intelligence level in instrument, all instrument circuitry fully utilized. Little knowledge of instrument circuitry necessary, since

only task interface performs is key closure. All existing logic and error checking still performed by instrument, minimizing workload of laboratory microcomputer. Timing constraints for interface operation minimal at keyboard entry level.

B89-10164

FAST ASYNCHRONOUS DATA COMMUNICATION VIA FIBER OPTICS

LARRY A. BERGMAN (Caltech), and ROBERT G. TELL (Chalmers Univ.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16972

Vol. 13, No. 4, P. 38

Transmitter and receiver devised for asynchronous digital communication via optical fiber at rates above 100 Mb/s. Transmitter converts parallel data to serial for high-speed transmission; receiver recovers clock signal and converts data back to parallel. No phase-lock loops used. New receiver design avoids over-sampling altogether. Local sampling oscillator operating nominally at clock frequency generates N clock signals of equally spaced phase, used to clock incoming data into N separate shift registers.

B89-10165

INTERFACE FOR FAULT-TOLERANT CONTROL SYSTEM

CHARLES SHAVER, and MICHAEL WILLIAMSON

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-13367)

ARC-11791

Vol. 13, No. 4, P. 40

Interface unit and controller emulator developed for research on electronic helicopter-flight-control systems equipped with artificial intelligence. Interface unit interrupt-driven system designed to link microprocessor-based, quadruply-redundant, asynchronous, ultra-reliable, fault-tolerant control system (controller) with electronic servocontrol unit that controls set of hydraulic actuators. Receives digital feedforward messages from, and transmits digital feedback messages to, controller through differential signal lines or fiber-optic cables (thus far only differential signal lines have been used). Analog signals transmitted to and from servocontrol unit via coaxial cables.

B89-10166

EIGHT-BIT-SLICE GAAS GENERAL PROCESSOR CIRCUIT

JOHN WEISSMAN (Rockwell International Corp.), and ROBERT V. GAUTHIER (Rockwell International Corp.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13012

Vol. 13, No. 4, P. 65

Novel GaAs 8-bit slice enables quick and efficient implementation of variety of fast GaAs digital systems ranging from central processing units of computers to special-purpose processors for communications and signal-processing applications. With GaAs 8-bit slice, designers quickly configure and test hearts of many digital systems that demand fast complex arithmetic, fast and sufficient register storage, efficient multiplexing and routing of data words, and ease of control.

B89-10167

DETECTOR FOR FM VOICE OR DIGITAL SIGNALS

FARAMAZ DAVARIAN (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16788

Vol. 13, No. 4, P. 66

Frequency-modulation (FM) detector operates with either analog audio (usually voice) signals or digital signals sent by differential

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minimum-shift keying (DMSK). Performance expected similar to conventional limiter/discriminator FM detectors. Detector operates at baseband, obviating need for band-pass filtering at intermediate frequency. Baseband version made in very-large-scale integrated circuit. New detector useful in mobile communications, where trend is toward integrated voice and data service.

B89-10217

OPTICAL ADDRESSING AND CLOCKING OF RAM'S

ALAN R. JOHNSTON (Caltech), ROBERT H. NIXON (Caltech), LARRY A. BERGMAN (Caltech), and SADIK ESENER (University of California)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16981

Vol. 13, No. 5, P. 32

Proposed random-access-memory (RAM) addressing system, in which memory linked optically to read/write logic circuits, greatly increases computer operating speed. System - comprises addressing circuits including numerous lasers as signal sources, numerous optical gates including optical detectors associated with memory cells, and holographic element to direct light signals to desired memory-cell locations - applied to high-capacity digital systems, supercomputers, and complex microcircuits.

B89-10218

FAST CORRECTION FOR DOPPLER IN MDPSK SIGNALS

M. K. SIMON (Caltech), and D. DIVSALAR (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16987

Vol. 13, No. 5, P. 34

Detector of multiple differential phase-shift-keyed (MDPSK) signals designed to effect combination of open-loop estimation of frequency and differential detection of digital modulation. Improved design expected to decrease probability of bit errors in situations in which carrier frequency uncertain and signals transmitted in bursts too short to allow closed-loop tracking of carrier frequency - for example, in transmission of digitally-coded voice signals in land-mobile/satellite communications at ultra-high frequencies.

B89-10219

OPTICAL FIRMWARE

LARRY A. BERGMAN (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16984

Vol. 13, No. 5, P. 36

Data-processing system exploits high speeds inherent in optical elements. Instruction sets for different computer operations reside on different external memory chips. Laser diodes activated for each operation generate light, reflected by holographic optical element to designated receptors in arithmetic and logic unit. Pattern of light beams embodies instruction set at given instant. With potential ability to reprogram in real time, conceptual system applicable to task-driven programming or artificial intelligence.

B89-10220

ALIGNMENT SYSTEM FOR DOCKING CONTROL

RICHARD S. IWASAKI (Axiomatix)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21156

Vol. 13, No. 5, P. 38

Concept for alignment of vehicle approaching station based on generation of coherent, polarized light or microwave beam by station and measurement of beam propagation and polarization axes by vehicle. Intended for use in docking of spacecraft in flight

and in robotics. Conical and corner-cube reflectors on vehicle disperse portions of incident light beam to sensors on vehicle and station, respectively. Station uses return signal for ranging and tracking. Known mathematical relationship among direction of beam and positions of reflected light on photodetector arrays used to calculate orientation of vehicle.

B89-10242

PROGRAM FOR A PUSHBUTTON DISPLAY

ANTHONY M. BUSQUETS, and WILLIAM S. LUCK, JR.

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13671

Vol. 13, No. 5, P. 69

Programmable Display Pushbutton (PDP) is pushbutton device available from Micro Switch having programmable 16X35 matrix of light-emitting diodes on pushbutton surface. Any desired legends display on PDP's, producing user-friendly applications reducing need for dedicated manual controls. Interacts with operator, calls for correct response before transmitting next message. Both simple manual control and sophisticated programmable link between operator and host system. Programmable Display Pushbutton Legend Editor (PDPE) computer program used to create light-emitting-diode (LED) displays for pushbuttons. Written in FORTRAN.

B89-10277

COUNTERROTATOR AND CORRELATOR FOR GPS RECEIVERS

J. BROOKS THOMAS (Caltech), JEFFREY M. SRINIVASAN (Caltech), and THOMAS K. MEEHAN (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16998

Vol. 13, No. 6, P. 34

Accurate, all-digital, high-speed processor comprising correlator and down-converter developed for receivers in Global Positioning System (GPS). Processor reduces roundoff and commensurability errors to extremely small values. Use of digital chip and phase advancers provides outstanding control and accuracy in phase and feedback. Great flexibility imparted by provision for arbitrary starting time and integration length. Minimum-bit design requires minimum number of logical elements, thereby reducing size, power, and cost.

B89-10278

IMAGE-ENHANCEMENT AID FOR THE PARTIALLY SIGHTED

T. A. LAWTON (Caltech), and D. B. GENNERY (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17307

Vol. 13, No. 6, P. 36

Digital filtering enhances ability to read and to recognize objects. Possible to construct portable vision aid by combining miniature video equipment to observe scene and display images with very-large-scale integrated circuits to implement real-time digital image-data processing. Afflicted observer views scene through magnifier to shift spatial frequencies downward and thereby improves perceived image. However, less magnification needed, larger the scene observed. Thus, one measure of effectiveness of new system is amount of magnification required with and without it. In series of tests, found 27 to 70 percent more magnification needed for afflicted observers to recognize unfiltered words than to recognize filtered words.

B89-10279

AIRPLANE-ACCELERATION DISPLAY FOR LOW-GRAVITY RESEARCH

MARC G. MILLIS

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18801)

LEW-14650

Vol. 13, No. 6, P. 38

Bar-graph display facilitates precise control of trajectories. Overall display system includes accelerometer block, power-supply-and-interface box, thrust-axis display, and pitch-and-lateral-axes display. Accelerometer block includes three servoaccelerometers orthogonally mounted on adjustable triaxial base allowing fine alignment of accelerometers with respect to airplane. Accelerometer block and power-supply-and-interface box located near center of gravity of airplane in luggage area. LED bar-graph displays take up less panel space and easier to align with axes represented. No moving parts and not subject to parallax. With help of display, pilot adheres to predetermined fraction of g , with minimal lateral acceleration.

B89-10280

CHIP ADVANCER FOR GPS RECEIVER

THOMAS K. MEEHAN (Caltech), JEFFREY M. SRINIVASAN (Caltech), and J. BROOKS THOMAS (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16996

Vol. 13, No. 6, P. 40

Instrument errors made negligible. For each integration interval, both delay and rate of change of delay initialized to small fraction of chip - for example, to order of 10 to the negative 7th power - thereby making feedback control and extraction of delay highly accurate and flexible. With appropriate selection of sampling rate relative to chip rate, commensurability errors reduced to extremely small levels. In Global Positioning System (GPS) receiver, pseudorandom code sequence generated by simple digital logic incorporating effects of time, delay, and rate of change of delay. Flexibility in starting time and sum interval very useful in aligning correlation interval with beginnings and endings of data bits.

B89-10281

THREE-DIMENSIONAL ROBOTIC VISION SYSTEM

THINH V. NGUYEN (Multisignal Technology Corp.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27191

Vol. 13, No. 6, P. 43

Stereoscopy and motion provide clues to outlines of objects. Digital image-processing system acts as 'intelligent' automatic machine-vision system by processing views from stereoscopic television cameras into three-dimensional coordinates of moving object in view. Epipolar-line technique used to find corresponding points in stereoscopic views. Robotic vision system analyzes views from two television cameras to detect rigid three-dimensional objects and reconstruct numerically in terms of coordinates of corner points. Stereoscopy and effects of motion on two images complement each other in providing image-analyzing subsystem with clues to natures and locations of principal features.

B89-10282

EXPERIMENTING WITH MULTIPROCESSOR SIMULATOR CONCEPTS

RICHARD A. BLECH, and ANTHONY D. WILLIAMS

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-28651)

LEW-14617

Vol. 13, No. 6, P. 44

Multiple microcomputer system used to investigate application of parallel processing to real-time simulation. With dual-base architecture, each microcomputer communicates with corresponding microcomputer on opposite bus through dual-port interface memory. Transfers of data to and from front-end processor occur on interactive information bus. Transfers of data related to simulation calculations occur on real-time-information

bus. System, called the real-time multiprocessor simulator (RTMPS), is tool for developing low-cost, portable, user-friendly simulators.

B89-10283

PASSIVITY IN ANALYSIS OF ROBUSTNESS OF A CONTROL SYSTEM

JOHN TING-YUNG WEN (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17589

Vol. 13, No. 6, P. 44

Robustness margin (measure of degree of passivity) defined. Paper presents new approach to analysis of stability of multivariable feedforward-and-feedback control system consisting of exponentially stable linear time-invariant (LTI) feedforward subsystem and nonlinear time-varying (NTV) or dynamic feedback subsystem. New method based on notion of passivity, quantified by robustness margin. Margin provides bound on magnitudes of perturbations, below which perturbations will not make system unstable.

B89-10284

ABSOLUTE STABILITY AND HYPERSTABILITY IN HILBERT SPACE

JOHN TING-YUNG WEN (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17590

Vol. 13, No. 6, P. 45

Theorems on stabilities of feedback control systems proved. Paper presents recent developments regarding theorems of absolute stability and hyperstability of feedforward-and-feedback control system. Theorems applied in analysis of nonlinear, adaptive, and robust control. Extended to provide sufficient conditions for stability in system including nonlinear feedback subsystem and linear time-invariant (LTI) feedforward subsystem, state space of which is Hilbert space, and input and output spaces having finite numbers of dimensions. (In case of absolute stability, feedback subsystem memoryless and possibly time varying. For hyperstability, feedback system dynamical system.)

B89-10285

PILOT DELAYS FOR THREE COCKPIT CONTROLLERS

CYNTHIA M. PRIVOZNIK, and DONALD T. BERRY

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-19324)

ARC-11797

Vol. 13, No. 6, P. 47

Pilot effective delay increases with system delay. Report compares pilot effective time delays measured in simulations of aircraft-control systems equipped with Space Shuttle rotational hand controller and with two versions of conventional stick-type hand controller. Report of interest to those concerned with design of multiple-axis controllers in aircraft, armored vehicles, industrial machinery, and remote manipulators: operator response or delay critical to stable and accurate operation of such systems.

B89-10344

DATA-PROCESSING SYSTEM FOR TEST AIRPLANE

R. J. RAY, J. W. HICKS, and R. I. ALEXANDER

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-21151)

ARC-12212

Vol. 13, No. 7, P. 32

Real-time display of data on performance supports decisions regarding maneuvers. Data from sensors aboard airplane transmitted to control station on ground for immediate processing and display. Data-acquisition subsystem aboard airplane uses both pulse code modulation and frequency modulation for transmission

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of sensor data on operation of engine, performance of airplane, and conditions in atmosphere. No data recorded on aircraft.

B89-10345

ADJUSTING SURFACES OF LARGE ANTENNA REFLECTORS SHARON L. PADULA, HOWARD M. ADELMAN, MARION C. BAILEY, and RAPHAEL T. HOFTKA (Virginia Polytechnic Inst. and State Univ.)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13851

Vol. 13, No. 7, P. 34

New approach more effective than traditional rms-surface-distortion approach. Optimization procedure for control of shape of reflector of large space antenna (LSA). Main feature is shape-controlling mathematical mechanism driven by need to satisfy explicit EM design requirements. Uses standard finite-element structural analysis, aperture-integration EM analysis, and constrained optimization techniques to predict set of actuator inputs that improves performance of antenna while minimizing applied control effort. Procedure applicable to wide variety of LSA concepts.

B89-10346

GENERAL-PURPOSE ELECTRONIC SYSTEM TESTS AIRCRAFT

RICHARD D. GLOVER

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16820)

ARC-12148

Vol. 13, No. 7, P. 36

Versatile digital equipment supports research, development, and maintenance. Extended aircraft interrogation and display system is general-purpose assembly of digital electronic equipment on ground for testing of digital electronic systems on advanced aircraft. Many advanced features, including multiple 16-bit microprocessors, pipeline data-flow architecture, advanced operating system, and resident software-development tools. Basic collection of software includes program for handling many types of data and for displays in various formats. User easily extends basic software library. Hardware and software interfaces to subsystems provided by user designed for flexibility in configuration to meet user's requirements.

B89-10347

RADAR POLARIMETER MEASURES ORIENTATIONS OF RETROREFLECTORS

H. A. ZEBKER (Caltech), and L. NORIKANE (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17231

Vol. 13, No. 7, P. 37

Polarization signatures of targets compared with known signatures at known angles. Experiments demonstrated use of radar polarimetry to measure orientation of retroreflective target, even though target much smaller than resolution element of radar. Technique based on comparison of angular dependencies of measured and theoretically derived polarization signatures of target. Polarization signature also used to identify target. Tilt of reflector inferred by finding angle minimizing measure of difference between theoretical and measured radar cross sections of reflector.

B89-10348

PULSE-POPULATION MODULATION FOR INDUCTION MACHINES

IRVING G. HANSEN

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-31584 and N87-22004)

LEW-14669

Vol. 13, No. 7, P. 38

Low-frequency synthesizer developed to provide low-frequency

waveform by synthesis from high-frequency power system. Waveform assembled by allowing conduction of discrete half cycles of high-frequency carrier. Frequency of synthesized wave controlled by pulse pattern. By controlling relationship between slip and stator frequencies, one operates induction motor either as motor or generator. Such bidirectional energy transducer used as starter/generator for engine, or as servo-mechanism for control of acceleration and deceleration. Other advantages include operation under controlled voltage-to-frequency ratios to maintain high-efficiency and high power factor, and no reflection of low-frequency noise into 20-kHz distribution bus.

B89-10349

BALANCED-LOAD REAL-TIME MULTIPROCESSOR SYSTEM

ROBERT D. RASMUSSEN (Caltech), ROBERT M. MANNING (Caltech), BLAIR F. LEWIS (Caltech), GARY S. BOLOTIN (Caltech), and RICHARD S. WARD (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17185

Vol. 13, No. 7, P. 40

Modularity and parallelism provide tolerance to faults and high throughput capacity. System, called MAX, is network of interconnected computers. MAX cluster consists of group of modules - each semiautonomous computer. Modules connected to each other and to other clusters by global bus and circuit-switched communication mesh.

B89-10350

ASSESSMENT OF DIGITAL CONTROL FOR HELICOPTERS

M. B. TISCHLER

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12187

Vol. 13, No. 7, P. 41

Report provides assessment of digital electronic flight-control technology for advanced helicopters intended for use in combat. Reviews state of art of high-bandwidth digital flight-control systems for airplanes, with emphasis on topics of concern for development of such systems for modern combat helicopters.

B89-10351

MULTIPLE-BASELINE INTERFEROMETRIC SYNTHETIC-APERTURE RADAR

F. K. LI (Caltech), and R. M. GOLDSTEIN (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17416

Vol. 13, No. 7, P. 42

Report discusses performances of spaceborne interferometric synthetic-aperture radar systems in terms of utility of SAR echo data in generation of topographic maps.

B89-10352

DETECTING IMPACTS OF PARTICLES ON SPACECRAFT

BRIAN M. LEMPRIERE (Boeing Aerospace Co.), ROBERT L. CARLSEN (Boeing Aerospace Co.), and JAMES M. NELSON (Boeing Aerospace Co.)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28278

Vol. 13, No. 7, P. 42

Report describes proposed network of acoustical sensors, in effect, miniature seismographic system, to detect impacts of particles on external panels of spacecraft. Inexpensive thin-film vibration sensors placed on insides of panels and connected to relatively-simple data-collection system. Meteoroid shields already planned for Space Station serves as panels on spacecraft.

Describes tests of concept in which small spheres impinged on aluminum panels. Tests showed sensor data used to determine locations and characteristics of impacts and panels provide suitable medium for detecting low-probability impacts of interest.

B89-10392**HYBRID ANALOG/DIGITAL RECEIVER**

D. H. BROWN (Caltech), and W. J. HURD (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17262**Vol. 13, No. 8, P. 28**

Advanced hybrid analog/digital receiver processes intermediate-frequency (IF) signals carrying digital data in form of phase modulation. Uses IF sampling and digital phase-locked loops to track carrier and subcarrier signals and to synchronize data symbols. Consists of three modules: IF assembly, signal-processing assembly, and test-signal assembly. Intended for use in Deep Space Network, but presumably basic design modified for such terrestrial uses as communications or laboratory instrumentation where signals weak and/or noise strong.

B89-10393**REDUCTION OF STRESSES IN GROWING SILICON WEBS**

C. S. DUNCAN (Westinghouse Electric Corp.), E. L. KOCHKA (Westinghouse Electric Corp.), PAUL A. PITROWSKI (Westinghouse Electric Corp.), and RAY G. SEIDENSTICKER (Westinghouse Electric Corp.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17137**Vol. 13, No. 8, P. 30**

New trenched lid intercepts less radiation from edges of growing silicon ribbon, giving rise to faster growth and temperature distribution resulting in lower residual stress. Cutting trench in susceptor lid allows edges of growing ribbon of silicon to cool more rapidly. Edges cool and solidify nearly same rate as center of ribbon, and thermal stress in ribbon reduced. Because of more-effective edge cooling, wider ribbon grown, and withdrawn at faster rate. Productivity of dendritic-web growth furnace increased.

B89-10394**FORCE/TORQUE DISPLAY FOR TELEROBOTIC SYSTEMS**

MARION A. WISE

Aug. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13727**Vol. 13, No. 8, P. 30**

Pictorial cathode-ray-tube (CRT) display of force and/or torque (F/T) data for telerobotic systems used as output monitor from multiaxis sensor or as command display. Relative positions of two circles represent forces and torques acting on object, derived from signals from F/T sensor composed of strain gauges. Graphical presentation generated on two different graphics systems, one in color and one in black and white. High-level programming facilitates use of additional convenient features in software extending usefulness of sensor data and display. Useful in laboratory experiments, monitoring performance of automated system and for present data on status of system to operator at control station.

B89-10395**CORRECTION AND USE OF JITTER IN TELEVISION IMAGES**

DANIEL B. DINER (Caltech), DEREK H. FENDER (Caltech), and ANTONY R. H. FENDER (LAMA Engineering, Inc.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17499**Vol. 13, No. 8, P. 32**

Proposed system stabilizes jittering television image and/or measures jitter to extract information on motions of objects in image. Alternative version, system controls lateral motion on camera to generate stereoscopic views to measure distances to objects. In another version, motion of camera controlled to keep object in view. Heart of system is digital image-data processor called 'jitter-miser', which includes frame buffer and logic circuits to correct for jitter in image. Signals from motion sensors on camera sent to logic circuits and processed into corrections for motion along and across line of sight.

B89-10396**DESIGN OF FEEDFORWARD CONTROLLERS FOR MULTIVARIABLE PLANTS**

HOMAYOUN SERAJI (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17177**Vol. 13, No. 8, P. 33**

Controllers based on simple low-order transfer functions. Mathematical criteria derived for design of feedforward controllers for class of multiple-input/multiple-output linear plants. Represented by simple low-order transfer functions, obtained without reconstruction of states of commands and disturbances. Enables plant to track command while remaining unresponsive to disturbance in steady state. Feedback controller added independently to stabilize plant or to make control system less susceptible to variations in parameters of plant.

B89-10397**RAPIDLY-INDEXING INCREMENTAL-ANGLE ENCODER**

PHILIP R. CHRISTON (Ball Corp.), and WALLACE W. MEYER (Ball Corp.)

Aug. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13154**Vol. 13, No. 8, P. 34**

Optoelectronic system measures relative angular position of shaft or other device to be turned, also measures absolute angular position after device turned through small angle. Relative angular position measured with fine resolution by optoelectronically counting finely- and uniformly-spaced light and dark areas on encoder disk as disk turns past position-sensing device. Also includes track containing coarsely- and nonuniformly-spaced light and dark areas, angular widths varying in proportion to absolute angular position. This second track provides gating and indexing signal.

B89-10398**MEASURING AIRFLOW WITH DIGITAL HOLOGRAPHIC INTERFEROMETRY**

FRANCISCO J. TORRES

Aug. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-24681)

ARC-12131**Vol. 13, No. 8, P. 34**

Digital image-processing system assists in analysis of holographic interferometric images of flow about airfoil. Operating semiautomatically, identifies, counts, and labels interference fringes, then processes distances between fringes into distribution of pressure on surface of airfoil. Yields data on pressure faster than manual image-analyses techniques, and data compares favorably with those obtained by manual analysis and by probe measurements of pressure. Uses computer programs evaluating interferograms along straight or curved lines represented by polygon segments. User prompted for such inputs as reference points and fringe number. Digitizes holographic interferograms of flow and processes them into data of pressure or other properties of flow.

B89-10433**DIGITAL SIGNAL PROCESSOR FOR GPS RECEIVERS**

J. B. THOMAS (Caltech), T. K. MEEHAN (Caltech), and J. M. SRINIVASAN (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16997

Vol. 13, No. 9, P. 36

Three innovative components combined to produce all-digital signal processor with superior characteristics: outstanding accuracy, high-dynamics tracking, versatile integration times, lower loss-of-lock signal strengths, and infrequent cycle slips. Three components are digital chip advancer, digital carrier downconverter and code correlator, and digital tracking processor. All-digital signal processor intended for use in receivers of Global Positioning System (GPS) for geodesy, geodynamics, high-dynamics tracking, and ionospheric calibration.

B89-10434**ADAPTIVE TELEMETRY MULTIPLEXER**

R. L. SINDERSON, G. A. SALAZAR, C. M. HADDICK, JR. (Lockheed Corp.), C. J. SPAHN (Lockheed Corp.), and C. N. VENKATESH (Lockheed Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21170

Vol. 13, No. 9, P. 38

Telemetry-data-acquisition unit adjusted remotely to produce changes in sampling rate, sampling channels, measurement scale, and output-bias level. Functional configuration adapted to changing conditions or new requirements by distant operator over telemetry link. Reconfiguration done in real time, without removing equipment from service. Bus-interface unit accepts reprogramming commands and translates them for low-rate adaptive multiplexer. Reprogrammable equipment reduces need for spare parts, since not necessary to stock variety of hardware with fixed characteristics. Adaptive multiplexer performs well in tests, amplitude errors less than 0.5 percent, distortion less than 0.25 percent, and crosstalk and common-mode rejection indiscernible.

B89-10435**VECTOR ADAPTIVE/PREDICTIVE ENCODING OF SPEECH**

JUIN-HWEY CHEN (California Univ.), and ALLEN GERSHO (California Univ.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17230

Vol. 13, No. 9, P. 40

Vector adaptive/predictive technique for digital encoding of speech signals yields decoded speech of very good quality after transmission at coding rate of 9.6 kb/s and of reasonably good quality at 4.8 kb/s. Requires 3 to 4 million multiplications and additions per second. Combines advantages of adaptive/predictive coding, and code-excited linear prediction, yielding speech of high quality but requires 600 million multiplications and additions per second at encoding rate of 4.8 kb/s. Vector adaptive/predictive coding technique bridges gaps in performance and complexity between adaptive/predictive coding and code-excited linear prediction.

B89-10436**SYNCHRONIZING PHOTOGRAPHY FOR HIGH-SPEED-ENGINE RESEARCH**

K. S. CHUN

Sep. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23902)

LEW-14713

Vol. 13, No. 9, P. 42

Light flashes when shaft reaches predetermined angle. Synchronization system facilitates visualization of flow in high-speed internal-combustion engines. Designed for cinematography and

holographic interferometry, system synchronizes camera and light source with predetermined rotational angle of engine shaft. 10-bit resolution of absolute optical shaft encoder adapted, and 2 to tenth power combinations of 10-bit binary data computed to corresponding angle values. Pre-computed angle values programmed into EPROM's (erasable programmable read-only memories) to use as angle lookup table. Resolves shaft angle to within 0.35 degree at rotational speeds up to 73,240 revolutions per minute.

B89-10437**HYPERSWITCH NETWORK FOR HYPERCUBE COMPUTER**

EDWARD CHOW (Caltech), HERBERT MADAN (Caltech), and JOHN PETERSON (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16905

Vol. 13, No. 9, P. 44

Data-driven dynamic switching enables high speed data transfer. Proposed hyperswitch network based on mixed static and dynamic topologies. Routing header modified in response to congestion or faults encountered as path established. Static topology meets requirement if nodes have switching elements that perform necessary routing header revisions dynamically. Hypercube topology now being implemented with switching element in each computer node aimed at designing very-richly-interconnected multicomputer system. Interconnection network connects great number of small computer nodes, using fixed hypercube topology, characterized by point-to-point links between nodes.

B89-10438**ROBOTIC VISION WOULD COMBINE OPTICS AND MICROWAVES**

KUMA KRISHNEN, SCOTT SHAW (Rice Univ.), and RUI J. P. DEFIGUEIREDO (Rice Univ.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21334

Vol. 13, No. 9, P. 46

Conceptual robot-vision system processes data from both microwave and visible-wavelength sensors. Concept, called 'fusion of sensors,' yields better information on shapes of some objects than obtained from one type of sensor alone. Proposed system fuses data from television images with polarized low-resolution radar-scattering cross sections. Using iterative procedure, generates successive approximations to shape of target by minimizing differences between observed radar returns and radar returns observed if object characterized by computed scattering transfer matrix.

B89-10439**DIGITAL 8-DPSK MODEM FOR TRELLIS-CODED COMMUNICATION**

T. C. JEDREY (Caltech), N. E. LAY (Caltech), and W. RAFFERTY (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17578

Vol. 13, No. 9, P. 47

Digital real-time modem processes octuple differential-phase-shift-keyed trellis-coded modulation. Intended for use in communicating data at rate up to 4.8 kb/s in land-mobile satellite channel (Rician fading) of 5-kHz bandwidth at carrier frequency of 1 to 2 GHz. Modulator and demodulator contain digital signal processors performing modem functions. Design flexible in that functions altered via software. Modem successfully tested and evaluated in both laboratory and field experiments, including recent full-scale satellite experiment. In all cases, modem performed within 1 dB of theory. Other communication systems benefitting from this type of modem include land mobile (without

satellites), paging, digitized voice, and frequency-modulation subcarrier data broadcasting.

B89-10498**MEASURING WINDS WITH PULSED C-BAND RADAR**

CARL LENNON, RICHARD WESENBERG, THOMAS O. BRITT, MICHAEL BROOKS, DELORIS EDWARDS, CHRIS FRANKLIN, JOHN KIRIAZES, BRAD KITAYAMA, and JIM MEDINA

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11415**Vol. 13, No. 10, P. 28**

Research has begun on use of pulsed C-band radar in multistatic configuration to measure winds in absence of clouds. Experimental system based on principle of multistatic radar. Multiple receivers track on same point in sky to measure winds from different angles, obtaining complete wind vector at that point. Includes one radar station that both transmits and receives and one or more other stations receiving only. Advantage of multistatic configuration greatly reduces effects of ground clutter on receive-only stations. Objective of effort to develop capability to use wind-measurement data to predict, as early and accurately as possible, formation of local thunderstorms-with lead times of several hours.

B89-10499**REAL-TIME OPTIMIZATION OF RECEIVER BANDWIDTH**

V. A. VILNROTTER (Caltech), W. J. HURD (Caltech), and D. H. BROWN (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17400**Vol. 13, No. 10, P. 30**

Estimates of signal and noise spectra enhance reception of weak signals. Carrier-tracking phase-locked loop represented by linear mathematical model at small rms phase errors. Loop continuously generates estimates of received phase. Bandwidth (in effect, scale of complex-frequency variable p) optimized to minimize rms phase error. Minimum signals tracked 5 to 15 dB below those tracked by current receivers. Improvement accomplished by use of bandwidths of 0.1 to 1.0 Hz, in contrast with 3-Hz bandwidth in current use. Principle of real-time optimization of bandwidth adapted to other situations to enhance reception of weak signals otherwise 'buried' in noise.

B89-10500**VLSI UNIVERSAL NOISELESS CODER**

ROBERT F. RICE (Caltech), JUN-JI LEE (Caltech), and WAI-CHI FANG (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17469**Vol. 13, No. 10, P. 30**

Proposed universal noiseless coder (UNC) compresses stream of data signals for efficient transmission in channel of limited bandwidth. Noiseless in sense original data completely recoverable from output code. System built as very-large-scale integrated (VLSI) circuit, compressing data in real time at input rates as high as 24 Mb/s, and possibly faster, depending on specific design. Approach yields small, lightweight system operating reliably and consuming little power. Constructed as single, compact, low-power VLSI circuit chip. Design of VLSI circuit chip made specific to code algorithms. Entire UNC fabricated in single chip, worst-case power dissipation less than 1 W.

B89-10501**DIGITAL VIDEO MEASUREMENTS OF WING DEFLECTIONS IN A WIND TUNNEL**

ALPHEUS W. BURNER, WALTER L. SNOW, WILLIAM K. GOAD,

and BROOKS A. CHILDERS

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13917**Vol. 13, No. 10, P. 32**

Solid-state cameras and computer-controlled image-acquisition system measure deformations of wind-tunnel models. Digital video model-deformation (VMD) system includes solid-state-array cameras and digital image-acquisition system controlled by personal computer. Eliminates both vibration-induced distortion associated with tube cameras and manual processing of video hardcopy images necessary in earlier version. AT-class personal computer controls two commercially available image-capture boards ganged to capture simultaneously two video images, each 752 picture elements wide and 480 picture elements high, in one-thirtieth of second. Video images digitized into 256 gray levels. Figure block diagram of system.

B89-10502**EXCITER FOR X-BAND TRANSMITTER AND RECEIVER**

CARL E. JOHNS (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17261**Vol. 13, No. 10, P. 34**

Report describes developmental X-band exciter for X-band uplink subsystem of Deep Space Network. X-band transmitter-exciting signal expected to have fractional frequency stability of 5.2×10^{-10} to negative 15th power during 1,000-second integration period. Generates coherent test signals for S- and X-band Block III translator of Deep Space Network, Doppler-reference signal for associated Doppler-extractor system, first-local-oscillator signal for associated receiver, and reference signal for associated ranging subsystem. Tests of prototype exciter show controlling and monitoring and internal phase-correcting loops perform according to applicable design criteria. Measurements of stability of frequency and of single-sideband noise spectral density of transmitter-exciting signal made subsequently.

B89-10545**DECENTRALIZED ADAPTIVE CONTROL FOR ROBOTS**

HOMAYOUN SERAJI (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17542**Vol. 13, No. 11, P. 30**

Precise knowledge of dynamics not required. Proposed scheme for control of multijointed robotic manipulator calls for independent control subsystem for each joint, consisting of proportional/integral/derivative feedback controller and position/velocity/acceleration feedforward controller, both with adjustable gains. Independent joint controller compensates for unpredictable effects, gravitation, and dynamic coupling between motions of joints, while forcing joints to track reference trajectories. Scheme amenable to parallel processing in distributed computing system wherein each joint controlled by relatively simple algorithm on dedicated microprocessor.

B89-10546**DIGITAL INTEGRATE-AND-DUMP FILTER WITH OFFSET SAMPLING**

R. SADR (Caltech), and W. J. HURD (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17437**Vol. 13, No. 11, P. 32**

Detection of weak signals improved slightly. Digital integrate-and-dump filter proposed for detection of weak rectangular-pulse signals corrupted by additive white Gaussian

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noise. Theory of filter takes account of degradation of performance caused by offset sampling.

B89-10547

PULSE VECTOR-EXCITATION SPEECH ENCODER

GRANT DAVIDSON (California Univ.), and ALLEN GERSHO (California Univ.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17131

Vol. 13, No. 11, P. 34

Proposed pulse vector-excitation speech encoder (PVXC) encodes analog speech signals into digital representation for transmission or storage at rates below 5 kilobits per second. Produces high quality of reconstructed speech, but with less computation than required by comparable speech-encoding systems. Has some characteristics of multipulse linear predictive coding (MPLPC) and of code-excited linear prediction (CELP). System uses mathematical model of vocal tract in conjunction with set of excitation vectors and perceptually-based error criterion to synthesize natural-sounding speech.

B89-10548

COMPUTATIONAL ARCHITECTURE FOR CONTROL OF REMOTE MANIPULATOR

ZOLTAN F. SZAKALY (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17401

Vol. 13, No. 11, P. 36

Synchronization done by hardware to reduce software overhead. Computing resources located at both master-arm node and slave-arm node. This architecture provides for effective control while reducing computational burden on host computer and reducing and balancing load on communication channel.

B89-10549

ROBOTIC TARGET-TRACKING SUBSYSTEM

LAWRENCE M. SHAWAGA

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11447

Vol. 13, No. 11, P. 36

Position and orientation of target measured in six degrees of freedom. Robotic vision subsystem measures relative position and orientation of specially designed target. Uses standard image-processing algorithms implemented directly in circuitry instead of computer programs. This feature makes it possible to extract complete sets of target-tracking data from successive image frames at rate of 30 frames per second. Five bright circles of target positioned in such way that video images of them processed into data on position and orientation of target relative to camera. Subsystem useful in industrial assembly operation requiring automatic joining of parts initially oriented and moving randomly.

B89-10550

IMPROVING ESTIMATES OF PHASE PARAMETERS WHEN AMPLITUDE FLUCTUATES

V. A. VILNROTTER (Caltech), D. H. BROWN (Caltech), and W. J. HURD (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17560

Vol. 13, No. 11, P. 38

Adaptive inverse filter applied to incoming signal and noise. Time-varying inverse-filtering technique developed to improve digital estimate of phase of received carrier signal. Intended for use where received signal fluctuates in amplitude as well as in phase and signal tracked by digital phase-locked loop that keeps its

phase error much smaller than 1 radian. Useful in navigation systems, reception of time- and frequency-standard signals, and possibly spread-spectrum communication systems.

B89-10551

SCANNING PHOTOELECTRON-EMISSION INSPECTION EQUIPMENT

RAYMOND L. GAUSE

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27203

Vol. 13, No. 11, P. 40

Surfaces to be bonded tested for cleanliness. Equipment includes commercial photoelectron-emission sensor. Inspected surface irradiated with ultraviolet photons from source in sensor head while anode in sensor head collects photoelectrons ejected from surface by absorbed photons. If intensity and spectrum of ultraviolet light and distance between sensor and surface held constant, then photocurrent varies according to amount and type of contamination.

B89-10552

FORCE-FEEDBACK CURSOR CONTROL

BLAKE HANNAFORD (Caltech), and ZOLTAN F. SZAKALY (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17520

Vol. 13, No. 11, P. 42

Robot controller moves cursor and manipulates images. Use of force-feedback hand-held controller proposed to help computer operators position cursors on computer video displays. To control cursor, hand controller replaces joystick or electronic mouse. Operator presses button on handle to obtain action when cursor reaches desired position indicated by icon or image. Controller has additional degrees of freedom.

B89-10595

WEIGHTED INTEGRATE-AND-DUMP FILTER

RAMIN SADR (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17423

Vol. 13, No. 12, P. 33

Digital weighted integrate-and-dump filter (WIDF) proposed for detection of weak rectangular-pulse signals corrupted by additive white Gaussian noise. Received signal first low-pass prefiltered, and samples taken at multiple of symbol frequency. Improved performance means lower sampling and processing rates used for given symbol rate, reducing cost of system.

B89-10596

USING BIT ERRORS TO DIAGNOSE FIBER-OPTIC LINKS

L. A. BERGMAN (Caltech), R. HARTMAYER (Caltech), and S. MARELID (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17433

Vol. 13, No. 12, P. 34

Technique for diagnosis of fiber-optic digital communication link in local-area network of computers based on measurement of bit-error rates. Variable optical attenuator inserted in optical fiber to vary power of received signal. Bit-error rate depends on ratio of peak signal power to root-mean-square noise in receiver. For optimum measurements, one selects bit-error rate between 10 to negative 8th power and 10 to negative 4th power. Greater rates result in low accuracy in determination of signal-to-noise ratios, while lesser rates require impractically long measurement times.

B89-10597**DIGITAL DOPPLER PROCESSOR FOR SPACEBORNE SCATTEROMETER**

LONG, D. G. (Caltech), CHONG-YUNG CHI (Caltech), and FUK K. LI (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17253**Vol. 13, No. 12, P. 36**

Report describes conceptual digital Doppler processor for NASA scatterometer (NSCAT), advanced version of SEASAT spaceborne radar scatterometer used to measure winds near surface of ocean. In NSCAT design, six antennas illuminate surface of ocean with fan-shaped beams.

B89-10598**PROGRESS IN IMAGING RADAR POLARIMETRY**

DANIEL N. HELD (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17247**Vol. 13, No. 12, P. 37**

Report traces development of imaging radar polarimetry at NASA's Jet Propulsion Laboratory during recent years. When fully developed, multipolarization synthetic-aperture radar (SAR) systems aboard aircraft and spacecraft expected to yield wealth of data for assessment of resources, agricultural forecasting, and verification of radar-scattering calculations.

B89-10599**TAU RANGING REVISITED**

ROBERT C. TAUSWORTHE (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17413**Vol. 13, No. 12, P. 38**

Report reviews history of tau ranging and advocates use of advanced electronic circuitry to revive this composite-code-uplink spacecraft-ranging technique. Very-large-scale integration gives new life to abandoned distance-measuring technique.

B89-10600**PULSE-POSITION MODULATION FOR OPTICAL COMMUNICATION**

M. D. RAYMAN (Caltech), and D. L. ROBINSON (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17506**Vol. 13, No. 12, P. 39**

Report discusses schemes for pulse-position modulation of neodymium: yttrium aluminum garnet (Nd:YAG) lasers for optical transmission of data between distant spacecraft and stations on Earth.

B89-10612**INTERACTIVE CONTROLS ANALYSIS (INCA)**

FRANK H. BAUER

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12998**Vol. 13, No. 12, P. 48**

Version 3.12 of INCA provides user-friendly environment for design and analysis of linear control systems. System configuration and parameters easily adjusted, enabling INCA user to create compensation networks and perform sensitivity analysis in convenient manner. Full complement of graphical routines makes output easy to understand. Written in Pascal and FORTRAN.

B90-10006**CAMERA WOULD MONITOR WELD-POOL CONTOURS**

STEPHEN S. GORDON (Rockwell International Corp.), and DAVID A. GUTOW (Rockwell International Corp.)

Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29450**Vol. 14, No. 1, P. 26**

Weld pool illuminated and viewed coaxially along welding torch. Proposed monitoring subsystem for arc welder provides image in which horizontal portions of surface of weld pool highlighted. Monitoring and analyzing subsystems integrated into overall control system of robotic welder. Control system sets welding parameters to adapt to changing conditions, maintaining surface contour giving desired pattern of reflections.

B90-10007**VLSI ARCHITECTURE FOR VITERBI DECODER**

IN-SHEK HSU (Caltech), TRIEU-KIE TRUONG (Caltech), I. S. REED (University of Southern California), and J. SUN (University of Southern California)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17310**Vol. 14, No. 1, P. 28**

'Pipeline' architecture developed for very-large-scale integrated (VLSI) Viterbi decoding circuits for binary convolutional codes of large constraint lengths. In scheme, single sequential processor computes path metrics in trellis diagram (diagram in which paths and nodes represent possible sequences of code states and in which metrics indicate relative likelihoods of sequences). Systolic-array method used to store path information as well as to choose path with best metric. VLSI Viterbi-decoder architecture is compromise between speed and complexity. Size of decoding circuit increases approximately linearly with constraint length of code, and additional circuit chips added with moderate numbers of interconnections.

B90-10008**GENERATING WEIGHTED TEST PATTERNS FOR VLSI CHIPS**

FARDAD SIAVOSHI (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17514**Vol. 14, No. 1, P. 30**

Improved built-in self-testing circuitry for very-large-scale integrated (VLSI) digital circuits based on version of weighted-test-pattern-generation concept, in which ones and zeros in pseudorandom test patterns occur with probabilities weighted to enhance detection of certain kinds of faults. Requires fewer test patterns and less computation time and occupies less area on circuit chips. Easy to relate switching activity in outputs with fault-detection activity by use of probabilistic fault-detection techniques.

B90-10009**PORTABLE HIGH-FREQUENCY DATA-ACQUISITION SYSTEM**

ROY W. MUSTAIN (Rockwell International Corp.)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21521**Vol. 14, No. 1, P. 30**

Compact unit made of readily available solid-state components. Proposed system for acquisition of rapidly changing data self-contained and portable. Conceived for monitoring such aerodynamic effects as flutter, vibration, shock, sound, and pressure. Offers precise and fast acquisition of data and large data-storage capacity: has maximum sampling rate of 125 kHz, access time of 15 ns, and 1-million-bit memory. Measures time with 'smart' (microprocessor-controlled) watch that maintains calendar time for more than 10 years without external power.

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Provides standby power from 'smart' battery furnishing up to 1 ampere-hour of charge if power from main batteries lost.

B90-10010

HYPERCUBE-COMPUTER ANALYSIS OF ELECTROMAGNETIC SCATTERING

J. E. PATTERSON (Caltech), P. C. LIEWER (Caltech), R. H. CALALO (Caltech), and F. MANSHADI (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17551

Vol. 14, No. 1, P. 33

Capabilities of hypercube and parallel processing demonstrated. Report describes use of Mark III Hypercube computer to analyze scattering of electromagnetic waves. Purpose of study to assess utility of parallel computing in such computation-intensive problems as large-scale electromagnetic scattering. Two electromagnetic codes based on different algorithms converted to run on Mark III Hypercube. First code implements finite-difference, time-domain solution of Maxwell's curl equations. Second code is Numerical Electromagnetics Code (NEC-2) which embodies frequency-domain method and developed to analyze electromagnetic responses of antennas and other metallic structures. On Mark III Hypercube with 32 active nodes, largest lattice contains about 2,048,000 unit cells.

B90-10018

ESTIMATION OF INTERFERENCE IN SATELLITE/GROUND COMMUNICATIONS

ANIL V. KANTAK (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17500

Vol. 14, No. 1, P. 45

Relative strengths of desired and interfering signals computed for known orbits. Satellite Interference Analysis and Simulation Using Personal Computers (AKSATINT) computer program calculates interference experienced by generic satellite communications receiving station from interfering satellite. Also computes interference-to-signal-power ratio, taking into account losses suffered by links. Of general use to designers of systems and managers of frequencies in selecting proper frequencies under interference scenarios. Written in BASIC.

B90-10048

GRAPHICAL DISPLAY OF TEST-FLIGHT TRAJECTORIES

ROBERT G. COMPERINI, and DONALD C. RHEA

Feb. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-20344)

ARC-12211

Vol. 14, No. 2, P. 28

Trajectories displayed directly on maps. Computer graphical system shows trajectories of experimental aircraft in real time during flight tests. Enables operator to choose variety of display modes and to issue course corrections to pilot. Principle of system adapted to variety of civil, military, and commercial uses in which paths of vehicles overlaid on maps - for example, in dispatching delivery vans.

B90-10049

VLSI REED-SOLOMON ENCODER WITH INTERLEAVER

IN-SHEK HSU (Caltech), L. J. DEUTSCH (Caltech), TRIEU-KIE TRUONG (Caltech), and I. S. REED (University of Southern California)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17280

Vol. 14, No. 2, P. 28

Size, weight, and susceptibility to burst errors reduced. Encoding

system built on single very-large-scale integrated (VLSI) circuit chip produces (255,223) Reed-Solomon (RS) code with programmable interleaving up to depth of 5. (225,223) RS encoder includes new remainder-and-interleaver unit providing programmable interleaving of code words. Remainder-and-interleaver unit contains shift registers and modulo-2 adders. Signals on 'turn' and 'no-turn' lines control depth of interleaving. Based on E. R. Berlekamp's bit-serial multiplication algorithm for (225,223) RS encoder over Galois Field (2 to the 8th power).

B90-10050

CARRYING SYNCHRONOUS VOICE DATA ON ASYNCHRONOUS NETWORKS

LARRY A. BERGMAN (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17431

Vol. 14, No. 2, P. 31

Buffers restore synchronism for internal use and permit asynchronism in external transmission. Proposed asynchronous local-area digital communication network (LAN) carries synchronous voice, data, or video signals, or non-real-time asynchronous data signals. Network uses double buffering scheme that reestablishes phase and frequency references at each node in network. Concept demonstrated in token-ring network operating at 80 Mb/s, pending development of equipment operating at planned data rate of 200 Mb/s. Technique generic and used with any LAN as long as protocol offers deterministic (or bonded) access delays and sufficient capacity.

B90-10051

COMPETITIVE PARALLEL PROCESSING FOR COMPRESSION OF DATA

DANIEL B. DINER (Caltech), and ANTONY R. H. FENDER (Lama Engineering)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17445

Vol. 14, No. 2, P. 32

Momentarily-best compression algorithm selected. Proposed competitive-parallel-processing system compresses data for transmission in channel of limited band-width. Likely application for compression lies in high-resolution, stereoscopic color-television broadcasting. Data from information-rich source like color-television camera compressed by several processors, each operating with different algorithm. Referee processor selects momentarily-best compressed output.

B90-10052

INTEGRATED OPTOELECTRONIC INTERFACE

JOSEPH KATZ (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17650

Vol. 14, No. 2, P. 33

Proposed optoelectronic integrated-circuit device serves as 'universal' or standard interface for transmission and reception of digital and analog signals in communication, data-processing, and control systems. Eliminates need for custom design of interface circuitry in sense that it embodies 'master-chip' design easily adaptable to use with specific equipment. Includes directly modulated semiconductor laser to generate light signals for transmission along optical fiber; positive/intrinsic/negative, avalanche, or other photodiode to detect light signals received along another optical fiber; and driving, synchronizing, preamplifying, and signal-regenerating circuitry. Multiplexes electronic signals before transmission and/or demultiplexes electronic signals after reception.

B90-10053**LASER DOPPLER AND RANGE SYSTEMS FOR SPACECRAFT**
P. W. KINMAN (Caltech), and R. M. GAGLIARDI (University of Southern California)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17486**Vol. 14, No. 2, P. 36**

Report discusses two types of proposed laser systems containing active transponders measuring distance (range) and line-of-sight velocity (via Doppler effect) between deep space vehicle and earth-orbiting satellite. Laser system offers diffraction advantage over microwave system. Delivers comparable power to distant receiver while using smaller transmitting and receiving antennas and less-powerful transmitter. Less subject to phase scintillations caused by passage through such inhomogeneous media as solar corona. One type of system called 'incoherent' because range and Doppler measurements do not require coherence with laser carrier signals. Other type of system called 'coherent' because successful operation requires coherent tracking of laser signals.

B90-10054**OUTPUT CONTROL USING FEEDFORWARD AND CASCADE CONTROLLERS**

HOMAYOUN SERAJI (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17420**Vol. 14, No. 2, P. 37**

Report presents theoretical study of open-loop control elements in single-input, single-output linear system. Focus on output-control (servomechanism) problem, in which objective is to find control scheme that causes output to track certain command inputs and to reject certain disturbance inputs in steady state. Report closes with brief discussion of characteristics and relative merits of feedforward, cascade, and feedback controllers and combinations thereof.

B90-10092**DISTURBANCE-ACCOMMODATING CONTROLLER WOULD AIM ANTENNA**

L. L. GRESHAM (Caltech), F. L. LANSING (Caltech), and C. N. GUIAR (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17631**Vol. 14, No. 3, P. 42**

Proposed system for aiming large paraboloidal-dish antenna based on theory of disturbance-accommodating control. Existing methods of control combined to suppress systematic errors. Approach is to cancel static errors for precise pointing of antenna by treating systematic misalignment errors, as well as servo-commands, as disturbances to controlled system. In controller, another vector estimated simultaneously with estimation of state vector. Other vector represents disturbance state, used in determining more-complete control strategy. Aiming improved through sequence of modifications solely in existing software.

B90-10093**DIGITAL DEMODULATOR FOR ADVANCED RECEIVER**

RAMIN SADR (Caltech), and WILLIAM J. HURD (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17628**Vol. 14, No. 3, P. 44**

Complexity and cost reduced by new design for half-band filters. Digital demodulator designed for use in reception of phase- and amplitude-modulated digital signals of bandwidths up to 15 MHz on microwave carriers. System performs coherent demodulation

in phase and in quadrature with carrier locked in phase to intermediate frequency of 10 MHz. Design suitable for fabrication in very-large-scale integrated circuitry. Principal innovative feature of demodulator is design of half-band digital low-pass filters that remove sum-frequency components.

B90-10094**PERIPHERAL EQUIPMENT INTERCHANGES BYTES OF DATA**

ROBERT B. AGUILAR (Rockwell International Corp.)

Mar. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29478**Vol. 14, No. 3, P. 48**

Method for conversion of data formats between incompatible computers reduces conversion time by 80 percent. Transposes high and low bytes of word so data from computer A match storage format of computer B. Two interface circuit boards convert data. Such boards ordinarily used for communication between computers. In format-conversion application, cable connecting boards modified so high-8-bit and low-8-bit data lines interchanged with result data words in proper format for computer B.

B90-10095**CONCEPT FOR GENERATION OF LONG PSEUDORANDOM SEQUENCES**

C. C. WANG (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17241**Vol. 14, No. 3, P. 50**

Conceptual very-large-scale integrated (VLSI) digital circuit performs exponentiation in finite field. Algorithm that generates unusually long sequences of pseudorandom numbers executed by digital processor that includes such circuits. Concepts particularly advantageous for such applications as spread-spectrum communications, cryptography, and generation of ranging codes, synthetic noise, and test data, where usually desirable to make pseudorandom sequences as long as possible.

B90-10096**HIGH-RESOLUTION IMAGING SPECTROMETER**

JEFF DOZIER (Caltech), and ALEXANDER F. H. GOETZ (Colorado Univ.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17624**Vol. 14, No. 3, P. 52**

Earth resources observed in greater detail. High-Resolution Imaging Spectrometer, undergoing development for use in NASA's Earth Observing System, measures reflectance of Earth's surface in visible and near-infrared wavelengths. From an orbit around Earth, instrument scans surface of Earth in 200 wavelength bands simultaneously. Produces images enabling identification of minerals in rocks and soils, important algal pigments in oceans and inland waters, changes in spectra associated with biochemistry of plant canopies, compositions of atmospheric aerosols, sizes of grains in snow, and contamination of snow by impurities that absorb visible light.

B90-10097**BALANCED-BRIDGE FEEDBACK CONTROL OF MOTOR**

BORIS J. LURIE (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17430**Vol. 14, No. 3, P. 52**

Sensitivity to variations in electrical and mechanical characteristics reduced. Proposed control system for motor-driven rotary actuator includes three nested feedback loops which, when

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properly designed, decoupled from each other. Intended to increase accuracy of control by mitigating such degrading effects as vibrations and variations in electrical and mechanical characteristics of structure rotated. Lends itself to optimization of performance via independent optimization of each of three loops. Includes outer, actuator, and driver feedback loops, configured so that actuator is subsystem, and driver is subsystem of actuator.

B90-10098

PROGRAMMABLE DIRECT-MEMORY-ACCESS CONTROLLER

DAVID F. HENDRY (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17341

Vol. 14, No. 3, P. 54

Proposed programmable direct-memory-access controller (DMAC) operates with computer systems of 32000 series, which have 32-bit data buses and use addresses of 24 (or potentially 32) bits. Controller functions with or without help of central processing unit (CPU) and starts itself. Includes such advanced features as ability to compare two blocks of memory for equality and to search block of memory for specific value. Made as single very-large-scale integrated-circuit chip.

B90-10107

ANALYZING OPTICAL COMMUNICATIONS LINKS

WILLIAM K. MARSHALL (Caltech), and BRIAN D. BURK (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17444

Vol. 14, No. 3, P. 68

Optical Communication Link Analysis Program, OPTI, analyzes optical and near-infrared communication links using pulse-position modulation (PPM) and direct detection. Link margins and design-control tables generated from input parameters supplied by user. Enables user to save sets of input parameters that define given link and read them back into program later. Alters automatically any of input parameters to achieve desired link margin. Written in FORTRAN 77.

B90-10149

NOISE-CONTAMINATION DETECTOR

RICHARD L. RANDALL (Rockwell International Corp.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29537

Vol. 14, No. 4, P. 34

Deviations in periods of output from tracking filter measured. Signal-analyzing system measures degree to which sinusoid contaminated by noise. Noise-contamination detector indirectly measures noise in noisy sinusoidal signal by measuring average value of fractional absolute dither in period of signal. Developed to measure noise in outputs of vibration sensors used to test bearings and other components of rotating machinery.

B90-10150

LARGE-CONSTRAINT-LENGTH, FAST VITERBI DECODER

O. COLLINS (Caltech), S. DOLINAR (Caltech), IN-SHEK HSU (Caltech), F. POLLARA (Caltech), E. OLSON (Caltech), J. STATMAN (Caltech), and G. ZIMMERMAN (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17639

Vol. 14, No. 4, P. 34

Scheme for efficient interconnection makes VLSI design feasible. Concept for fast Viterbi decoder provides for processing of convolutional codes of constraint length K up to 15 and rates

of 1/2 to 1/6. Fully parallel (but bit-serial) architecture developed for decoder of $K = 7$ implemented in single dedicated VLSI circuit chip. Contains six major functional blocks. VLSI circuits perform branch metric computations, add-compare-select operations, and then store decisions in traceback memory. Traceback processor reads appropriate memory locations and puts out decoded bits. Used as building block for decoders of larger K.

B90-10151

TESTING MICROWAVE LANDING SYSTEMS WITH SATELLITE NAVIGATION

JOHN J. KIRIAZES

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11451

Vol. 14, No. 4, P. 36

Less time and equipment needed to perform tests. Satellite-based Global Positioning System (GPS) measures accuracy of microwave scanning-beam landing system (MSBLS) at airports used to support Shuttle landings. Provides time and three-dimensional information on position and velocity with unprecedented accuracy. Useful for testing other electronic navigation aids like LORAN, TACAN and microwave landing systems (MLS).

B90-10152

ARRAY FEED TO COMPENSATE FOR DISTORTION IN ANTENNA

Y. RAHMAT-SAMII (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17667

Vol. 14, No. 4, P. 38

System partly restores desired far-field radiation pattern. Adaptive array feed for paraboloidal-reflector antenna helps compensate for effects of slow changes in shape of reflecting surface. Counteracts distortion by illuminating reflector with wave fronts that have 'opposite' distortion.

B90-10153

ACQUISITION OF SPREAD-SPECTRUM CODE

UNJENG CHENG (Caltech), WILLIAM J. HURD (Caltech), and JOSEPH I. STATMAN (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17472

Vol. 14, No. 4, P. 38

Effects of Doppler shift and data modulation taken into account. Two advanced schemes for acquisition of direct-sequence spread-spectrum codes proposed. M1-Lag correlator in each strip of spread-spectrum-code detector operates at different offset code-chip time. Each offset represents assumed (tentative) Doppler shift. Schemes have highly parallel architecture implemented with currently available technology. Possible to use hybrid parallel/serial architecture in which acquisition time varies in inverse proportion to number of correlators and fast-Fourier-transform processors.

B90-10154

TRELLIS-CODED MDPSK SYSTEM WITH DOPPLER CORRECTION

D. DIVSALAR (Caltech), and M. K. SIMON (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17644

Vol. 14, No. 4, P. 40

Multiple-differential-phase-shift-keyed (MDPSK) microwave system designed for communications between mobile and/or fixed terrestrial stations via satellite transponders. Stations in system

transmit and receive data or digitally-coded voice signals at rates up to 4.8 kb/s in channels only 5 kHz wide. Incorporates advanced encoding, decoding, modulation, and demodulation techniques to minimize effects of error bursts. Uses feedforward techniques for fast recovery from deep fades.

B90-10155**COMPUTER ASSEMBLES MOSAICS OF SATELLITE-SAR IMAGERY**

R. KWOK (Caltech), J. C. CURLANDER (Caltech), and S. S. PANG (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17683**Vol. 14, No. 4, P. 42**

Digital image-processing system assembles maplike mosaic images of large areas of Earth from overlapping images of smaller areas generated by spaceborne synthetic-aperture radar (SAR). Automatically registers and blends smaller images with each other. Eliminates need for time-consuming, tedious manual processing. Modifiable to accept images from spaceborne optical sensors.

B90-10156**CONTROLLING SHAPE AND VIBRATION OF ANTENNAS**

E. METTLER (Caltech), R. E. SCHEID (Caltech), and D. B. ELDRED (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17598**Vol. 14, No. 4, P. 43**

Report discusses application of advanced techniques to maintain large wrap-rib, offset-feed spaceborne antenna reflector in precise shape required for high performance. Idea is to use integrated system of sensors, control processor, and actuators to measure and suppress both vibrations and static or slowly varying (e.g., thermal) deviations from desired shape. Technology applicable to other elastically deformable structures.

B90-10157**MORE ABOUT FIXED-LAG SMOOTHERS FOR TRACKING CARRIERS**

RAJENDRA KUMAR (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17389**Vol. 14, No. 4, P. 45**

Performance in presence of fades improved. Report amplifies and extends subject matter of 'Performance of Fixed-Lag Phase-Smoothing Algorithms' (NPO-17202). Fixed-lag smoothers also used to mitigate effects of short, deep fades, including multipath effects, in mobile or fixed terrestrial receivers of frequency- or phase-modulated signals.

B90-10158**OPERATION OF THE X-29A DIGITAL FLIGHT-CONTROL SYSTEM**

VINCE CHACON, and DAVID MCBRIDE

Apr. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-21152)'Operational Viewpoint of the X-29A Digital Flight Control System'

ARC-12209**Vol. 14, No. 4, P. 45**

Report reviews program of testing and evaluation of digital flight-control system for X-29A airplane, with emphasis on operation during tests. Topics include design of system, special electronic testing equipment designed to aid in daily operations, and aspects of testing, including detection of faults.

B90-10209**ENHANCED DATA-ACQUISITION SYSTEM**

ROY W. MUSTAIN (Rockwell International Corp.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21598**Vol. 14, No. 5, P. 36**

Time-consuming, costly digitization of analog signals on magnetic tape eliminated. Proposed data-acquisition system provides nearly immediate access to data in incoming signals by digitizing and recording them both on magnetic tape and on optical disk. Tape and/or disk later played back to reconstruct signals in analog or digital form for analysis. Of interest in industrial and scientific applications in which necessary to digitize, store, and/or process large quantities of experimental data.

B90-10210**SIMPLIFIED CORRELATOR FOR RANGING CODES**

R. C. TAUSWORTHE (Caltech), and J. R. SMITH (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17415**Vol. 14, No. 5, P. 36**

Improved correlating subsystem of pseudorandom-code ranging system made possible by advent of fast, custom-made, very-large-scale integrated circuits. Performs far fewer arithmetical operations, contains much less specialized analog and digital circuitry, and used with large number of different codes.

B90-10211**OPTICAL DETECTION OF DEFORMATIONS OF AN ANTENNA**

L. L. SCHUMACHER (Caltech), and H. C. VIVIAN (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17677**Vol. 14, No. 5, P. 38**

Proposed control subsystem generates small aiming-bias signals to correct for deviations of 70-m-diameter reflector of microwave antenna from its ideal shape. Takes optical measurements to determine deformations produced by such environmental factors as wind, gravity, and thermal differentials. Using these measurements, subsystem estimates misalignment of radiation pattern caused by deformations. Signals to correct for estimated misalignment added to angle-command signals of main antenna-aiming system. To measure deviations laser ranging devices placed at base of feed on rigid intermediate reference structure, white retroreflectors placed on parts that deviate from assigned positions relative to intermediate reference structure.

B90-10212**PROCESSOR WOULD FIND BEST PATHS ON MAP**

SILVIO P. EBERHARDT (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17716**Vol. 14, No. 5, P. 40**

Proposed very-large-scale integrated (VLSI) circuit image-data processor finds path of least cost from specified origin to any destination on map. Cost of traversal assigned to each picture element of map. Path of least cost from originating picture element to every other picture element computed as path that preserves as much as possible of signal transmitted by originating picture element. Dedicated microprocessor at each picture element stores cost of traversal and performs its share of computations of paths of least cost. Least-cost-path problem occurs in research, military maneuvers, and in planning routes of vehicles.

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B90-10213

SYSTEM DETECTS VIBRATIONAL INSTABILITIES

RICHARD J. BOZEMAN, JR.

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21408

Vol. 14, No. 5, P. 41

Sustained vibrations at two critical frequencies trigger diagnostic response or shutdown. Vibration-analyzing electronic system detects instabilities of combustion in rocket engine. Controls pulse-mode firing of engine and identifies vibrations above threshold amplitude at 5.9 and/or 12kHz. Adapted to other detection and/or control schemes involving simultaneous real-time detection of signals above or below preset amplitudes at two or more specified frequencies. Potential applications include rotating machinery and encoders and decoders in security systems.

B90-10214

DESIGNING DIGITAL CONTROL SYSTEMS WITH AVERAGED MEASUREMENTS

MICHAEL E. POLITES, and GUY O. BEALE

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28362

Vol. 14, No. 5, P. 42

Rational criteria represent improvement over 'cut-and-try' approach. Recent development in theory of control systems yields improvements in mathematical modeling and design of digital feedback controllers using time-averaged measurements. By using one of new formulations for systems with time-averaged measurements, designer takes averaging effect into account when modeling plant, eliminating need to iterate design and simulation phases.

B90-10215

DIGITAL CONTROLLER FOR EMERGENCY BEACON

WILLIAM D. IVANCIC

May 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-26566)'COSPAS/SARSAT 406-MHz Emergency Beacon Digital Controller'

LEW-14857

Vol. 14, No. 5, P. 43

Prototype digital controller intended for use in 406-MHz emergency beacon. Undergoing development according to international specifications, 406-MHz emergency beacon system includes satellites providing worldwide monitoring of beacons, with Doppler tracking to locate each beacon within 5 km. Controller turns beacon on and off and generates binary codes identifying source (e.g., ship, aircraft, person, or vehicle on land). Codes transmitted by phase modulation. Knowing code, monitor attempts to communicate with user, monitor uses code information to dispatch rescue team appropriate to type and locations of carrier.

B90-10216

SAMPLING DOWNCONVERTER FOR RADIO-FREQUENCY SIGNALS

J. B. THOMAS (Caltech), B. RAYHRER (Caltech), and L. E. YOUNG (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17530

Vol. 14, No. 5, P. 44

Phase and delay errors reduced greatly. Proposed GaAs integrated-circuit for receiver of radio signals at gigahertz frequencies samples incoming signal in phase and in quadrature, digitizes it, and down-converts it to baseband in single step. Incorporates both digital and analog components in design offering improved stability, versatility, and sampling bandwidth. Eliminates need for several components found in conventional analog designs, including mixers, postmixer filters, and 90 degree phase shifter.

B90-10217

FREQUENCY-DOMAIN SIGNAL PROCESSOR FOR LASER VELOCIMETER

JAMES F. MEYERS, JAMES I. CLEMMONS, JR., JOHN W. STOUGHTON (Old Dominion Univ.), SHARAD V. KANETKAR (Old Dominion Univ.), and ANDREAS E. SAVAKIS (Old Dominion Univ.)

May 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-27994)'Frequency Domain Laser Velocimeter Signal Processor'

LAR-13552

Vol. 14, No. 5, P. 45

Dynamic range and accuracy increased. New signal processor for laser-velocimeter (LV) applications overcomes major limitations of present signal processors. System requires no input-signal conditioning other than that provided by amplifiers; it operates in instantaneous mode at signal levels from bursts containing as few as 150 photons down to photon-resolved regime in averaging mode. Digital value of signal-burst frequency sent to external computer system for conversion to value of absolute frequency. Residual turbulence intensity 0.2 percent, with little dependence on signal-to-noise ratio.

B90-10218

ELECTRONICALLY SCANNED LASER RANGEFINDER

KATSUTNORI SHIMADA (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17571

Vol. 14, No. 5, P. 46

Proposed electronic laser scanner sweeps across its field of view without any moving parts, measuring distances to objects between 0.5 and 20 meters away. Immune to wear, stress, and breakage to which mechanical scanners subject. Guides robotic vehicle around obstacles.

B90-10219

POLYNOMIAL COMPENSATION, INVERSION, AND APPROXIMATION

YORAM BARAM

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12174

Vol. 14, No. 5, P. 46

New criterion introduced for design of discrete-time compensator. Method devised for polynomial compensation, inversion, and approximation of discrete-time linear systems. Involves quadratic measure of difference between response of compensated system and desired response. Impulse response of compensated system improves as degree of polynomial increases. Compensator emphasizes matching of large initial response. Compensators used in variety of applications, including navigation systems for spacecraft, aircraft, ships, and automated manufacturing equipment.

B90-10229

PROGRAM FOR ENGINEERING ELECTRICAL CONNECTIONS

JOSEPH W. BILLITTI (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17619

Vol. 14, No. 5, P. 62

DFACS is interactive multiuser computer-aided-engineering software tool for system-level electrical integration and cabling engineering. Purpose of program to provide engineering community with centralized data base for putting in and gaining access to data on functional definition of system, details of end-circuit pinouts in systems and subsystems, and data on wiring harnesses. Objective, to provide instantaneous single point of interchange of information, thus avoiding error-prone, time-consuming, and costly

shuttling of data along multiple paths. Designed to operate on DEC VAX mini or micro computer using Version 5.0/03 of INGRES.

B90-10263

PARALLEL ARCHITECTURE FOR ROBOTICS COMPUTATION

AMIR FIJANY (Caltech), and ANTAL K. BEJCZY (Caltech)
Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17629

Vol. 14, No. 6, P. 36

Universal Real-Time Robotic Controller and Simulator (URRCS) is highly parallel computing architecture for control and simulation of robot motion. Result of extensive algorithmic study of different kinematic and dynamic computational problems arising in control and simulation of robot motion. Study led to development of class of efficient parallel algorithms for these problems. Represents algorithmically specialized architecture, in sense capable of exploiting common properties of this class of parallel algorithms. System with both MIMD and SIMD capabilities. Regarded as processor attached to bus of external host processor, as part of bus memory.

B90-10264

REMOTE MAINTENANCE MONITORING

RICHARD C. OWENS, LORENZ SIMKINS, and DONN ROCHETTE (Grumman Technical Services, Inc.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11398

Vol. 14, No. 6, P. 38

Automated system gives new life to aging network of computers. Remote maintenance monitoring system developed to diagnose problems in large distributed computer network. Consists of data links, displays, controls, software, and more than 200 computers. Uses sensors to collect data on failures and expert system to examine data, diagnose causes of failures, and recommend cures. Designed to be retrofitted into launch processing system at Kennedy Space Center. Reduces downtime, lowers workload and expense of maintenance, and makes network less dependent on human expertise.

B90-10265

32-BIT-WIDE MEMORY TOLERATES FAILURES

GLENN A. BUSKIRK (IBM)

Jun. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21566

Vol. 14, No. 6, P. 38

Electronic memory system of 32-bit words corrects bit errors caused by some common type of failures - even failure of entire 4-bit-wide random-access-memory (RAM) chip. Detects failure of two such chips, so user warned that output of memory may contain errors. Includes eight 4-bit-wide DRAM's configured so each bit of each DRAM assigned to different one of four parallel 8-bit words. Each DRAM contributes only 1 bit to each 8-bit word.

B90-10266

BAR-CODE SYSTEM TRACKS TEST EQUIPMENT

JACOB R. ROGERS, LESA M. BENTON, and ROBERTA A. PERRY

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11370

Vol. 14, No. 6, P. 42

Administration of complicated system speeded and simplified. Computer system uses bar codes to keep track of more than 2,200 items of test equipment. BETUS (Barcode Equipment Tracking and Utilization System), maintains data base on what items borrowed, who is using them and where, and when calibrated. Keeps records on tools and small electronic components. Saves

on equipment purchases and recovers missing equipment more quickly. Cuts check-in and checkout time by 90 percent.

B90-10267

FAST, CAPACIOUS DISK MEMORY DEVICE

RONALD M. MULLER

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13196

Vol. 14, No. 6, P. 44

Device for recording digital data on, and playing back data from, memory disks has high recording or playback rate and utilizes available recording area more fully. Two disks, each with own reading/writing head, used to record data at same time. Head on disk A operates on one of tracks numbered from outside in; head on disk B operates on track of same number in sequence from inside out. Underlying concept of device applicable to magnetic or optical disks.

B90-10268

DOUBLE DIFFERENTIAL ENCODING AND DETECTION IN MPSK

D. DIVSALAR (Caltech), and M. K. SIMON (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17666

Vol. 14, No. 6, P. 46

Proposed communication system based on multiple-phase-shift-keying (MPSK) modulation includes double differential encoder in transmitter and double differential detector in receiver. Transmitter generates phase-modulated signal suitable for decoding and detection by subsystem. Detector removes Doppler-frequency component from noisy, Doppler-shifted signal encoded in subsystem. Overall effect of double-differential scheme to cancel effect of Doppler shift on modulation in received signal. Not necessary to estimate Doppler shift to correct for it.

B90-10269

PROGRAMMABLE REMAPPER

RICHARD D. JUDAY, TIMOTHY E. FISHER, and JEFFREY B. SAMPSELL (Texas Instruments, Inc.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21350

Vol. 14, No. 6, P. 46

Input image remapped rapidly and accurately onto different coordinate grid. Analog/digital electronic image-processing system developed to warp input images onto arbitrary coordinate grids at video rates. Advantages of system include antialiasing effect of many-to-one data path and speed of lookup-table operation. Lookup tables reprogrammed easily with help of computer that generates table values from mathematical description of desired transformation. Applications include real-time corrections of distortions in input optics of image sensors, corrections for repeatable nonlinear scanning, and aiding persons of impaired vision by deliberately distorting images onto remaining functional portions of retinas.

B90-10270

SIMPLIFIED DYNAMIC CONTROL OF REDUNDANT MANIPULATORS

HOMAYOUN SERAJI (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17593

Vol. 14, No. 6, P. 48

Simplified scheme proposed for dynamic control of robotic manipulator having redundant joints; that is, extra degrees of

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freedom beyond needed to perform task, to position and orient end effector at specified position and/or move it along specified trajectory. Extra degrees of freedom used to perform simultaneous subtask. Scheme adaptive and based on observed performance of manipulator. Involves neither complicated mathematical model of dynamics of manipulator nor time-consuming inverse kinematic transformation.

B90-10271

COMPACT ANALYZER/CONTROLLER FOR OXYGEN-ENRICHMENT SYSTEM

RICHARD L. PUSTER, JAG J. SINGH, and DANNY R. SPRINKLE
Jun. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N84-11460), (N86-20753), (N87-20514)

LAR-14016

Vol. 14, No. 6, P. 50

System controls hypersonic air-breathing engine tests. Compact analyzer/controller developed, built, and tested in small-scale wind tunnel prototype of the 8' HTT (High-Temperature Tunnel). Monitors level of oxygen and controls addition of liquid oxygen to enrich atmosphere for combustion. Ensures meaningful ground tests of hypersonic engines in range of speeds from mach 4 to mach 7.

B90-10272

ROBUST ADAPTIVE CONTROL IN HILBERT SPACE

JOHN TING-YUNG WEN (Caltech), and MARK J. BALAS (Colorado University)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17588

Vol. 14, No. 6, P. 53

Paper discusses generalization of scheme for adaptive control of finite-dimensional system to infinite-dimensional Hilbert space. Approach involves generalization of command-generator tracker (CGT) theory. Does not require reference model to be same order as that of plant, and knowledge of order of plant not needed. Suitable for application to high-order systems, main emphasis on adjustment of low-order feedback-gain matrix. Analysis particularly relevant to control of large, flexible structures.

B90-10273

SELECTING MODULATION INDICES FOR TELEMETRY AND RANGING

TIEN M. NGUYEN (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17535

Vol. 14, No. 6, P. 54

Report describes algorithm for selection of optimum modulation indices in system for communication between ground station and spacecraft, in which ranging channel operated simultaneously with data (command and telemetry) channel. Provides for optimum division of power among data, ranging, and carrier channels and reduces degradation of performance by undesired interferences among signals.

B90-10324

NEURAL-NETWORK COMPUTER TRANSFORMS COORDINATES

GARY M. JOSIN (Neural Systems, Inc.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17753

Vol. 14, No. 7, P. 35

Numerical simulation demonstrated ability of conceptual neural-network computer to generalize what it has 'learned' from few examples. Ability to generalize achieved with even simple neural network (relatively few neurons) and after exposure of

network to only few 'training' examples. Ability to obtain fairly accurate mappings after only few training examples used to provide solutions to otherwise intractable mapping problems.

B90-10325

MULTIBEAM 1.4-GHZ PUSHBROOM MICROWAVE RADIOMETER

ROLAND W. LAWRENCE, MARION C. BAILEY, RICHARD F. HARRINGTON, CHASE P. HEARN, JOHN G. WELLS, JR., and WILLIAM L. STANLEY (Old Dominion Research Foundation)
Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-11105)'Design and Development of a Multibeam 1.4 GHz Pushbroom Microwave Radiometer.'

LAR-14023

Vol. 14, No. 7, P. 38

Airborne prototype of multiple-beam pushbroom microwave radiometer (PBMR) developed to advance radiometric technology necessary for remote sensing of geophysical parameters. Instrument used in several joint Langley Research Center/United States Department of Agriculture soil-moisture flight experiments in Virginia, Texas, and California. Data from experiments used to modify, develop, and verify algorithms used to predict soil moisture from remote-sensing measurements. Image data useful in study of effects of characters of beams on radiometer imaging data.

B90-10326

AIR-VELOCITY SENSOR FOR HELICOPTER

H. DOUGLAS GARNER, and RICHARD F. HELLBAUM

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13598

Vol. 14, No. 7, P. 39

New airspeed sensor conceived for accurate measurement of both airspeed and direction of flight of helicopter. Direction of motion of helicopter displayed by lighting of one of series of lamps encircling digital display of airspeed. Pressure transducer measures difference between impact and static pressures at tip of rotor blade by use of conventional pitot-static-tube assembly.

B90-10327

FAST, REAL-TIME, ANIMATED DISPLAYS

WILLIAM M. KAHLBAUM, and KATRINA OWNBEY

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-19899)'High-Speed, Real-Time, Animated Displays on the ADAGE (R) RDS 3000 Raster Graphics System'

LAR-14140

Vol. 14, No. 7, P. 40

Displays for Advanced Concepts Simulator (ACS) generated on Adage Raster Display System 3000 (RDS 3000). Improved programming techniques developed, and revisions to language implementation made. Both types of changes took better advantage of high-speed characteristics of RDS 3000 hardware. Increases in speed resulted from: utilization of parallel-processing capabilities of AGG4, and use of AGG4 to take advantage of certain high-speed characteristics of display memory not previously used. Result was fourfold increase in animation-update rate to 16 frames per second.

B90-10328

PROGRAMMABLE CADENCE TIMER

WILLIAM A. HALL (Krug International), and JOHN GILBERT (Krug International)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21551

Vol. 14, No. 7, P. 42

Electronic metronome paces users through wide range of exercise routines. Conceptual programmable cadence timer provides rhythmic aural and visual cues. Timer automatically changes cadence according to program entered by the user. It

also functions as clock, stopwatch, or alarm. Modular pacer operated as single unit or as two units. With audiovisual module moved away from base module, user concentrates on exercise cues without distraction from information appearing on the liquid-crystal display. Variety of uses in rehabilitative medicine, experimental medicine, sports, and gymnastics. Used in intermittent positive-pressure breathing treatment, in which patient must rhythmically inhale and retain medication delivered under positive pressure; and in incentive spirometer treatment, in which patient must inhale maximally at regular intervals.

B90-10329**GENERAL-PURPOSE DATA-FORMATTING INPUT/OUTPUT SYSTEM**

ANTHONY M. BUSQUETS, and THOMAS W. HOGGE

Jul. 1990 No additional information available. For specific technical questions contact TU Officer at Center of origin.

LAR-13529**Vol. 14, No. 7, P. 42**

Multiplexable input/output (I/O) system developed as interface between host computer and real-time, fixed-base simulator cockpit. Unit designed to be general-purpose interface and operated through virtually any 8- or 16-bit, transistor/transistor-logic-level, parallel-I/O port with or without handshaking. Accepts byte-coded data in form of data blocks from host computer and routes data to various system I/O modules like discrete outputs, lamp drivers, and seven-segment-display drivers. Formats and routes data from input modules back to host computer. Other modules designed to drive alphanumeric displays and communications interfaces and to serve as analog-to-digital and digital-to-analog converter modules.

B90-10330**FIBER-OPTIC FREQUENCY-TRANSFER LINK**

L. E. PRIMAS (Caltech), R. L. SYDNOR (Caltech), and G. F. LUTES (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17703**Vol. 14, No. 7, P. 43**

System for distribution of 100-MHz reference signal features transmission through optical fiber to station 22 km away and stabilization of frequency by radio frequency phase-conjugation method. Compensates for variations in phase (caused mostly by changes in temperature along optical fiber) of signal arriving at remote station. Involves measurement and control of phases of transmitted and reflected signals at reference station to obtain reference phase at remote station.

B90-10331**FLUX-FEEDBACK MAGNETIC-SUSPENSION ACTUATOR**

NELSON J. GROOM

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-21135)'A Magnetic Bearing Control Approach Using Flux Feedback'

LAR-13785**Vol. 14, No. 7, P. 44**

Flux-feedback magnetic-suspension actuator provides magnetic suspension and control forces having linear transfer characteristics between force command and force output over large range of gaps. Hall-effect devices used as sensors for electronic feedback circuit controlling currents flowing in electromagnetic windings to maintain flux linking suspended element at substantially constant value independent of changes in length of gap. Technique provides effective method for maintenance of constant flux density in gap and simpler than previous methods. Applications include magnetic actuators for control of shapes and figures of antennas and of precise segmented reflectors, magnetic suspensions in devices for storage of angular momentum and/or kinetic energy, and systems for control, pointing, and isolation of instruments.

B90-10389**HELMET-MOUNTED VISUAL DISPLAY FOR FLIGHT SIMULATION**

ANTHONY M. COOK

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12160**Vol. 14, No. 8, P. 30**

Helmet-mounted visual display system provides pilot with broad range of visual information for flight simulation. Offers nearly unlimited field of regard. Optical fibers transmit wide-angle images in response to motions of head. Two 'pancake' lenses mounted on lightweight helmet. Cable of optical fibers carries images to each lens. 'Light-valve' projectors deliver computer-generated binocular images to cables.

B90-10390**COMPENSATING FOR DOPPLER SHIFT IN LASER INSTRUMENTATION**

GEARY K. SCHWEMMER

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13194**Vol. 14, No. 8, P. 31**

Electronic tuning system continually adjusts frequency of tunable diode laser to compensate for Doppler shift caused by motion of transmitter or receiver containing laser. Doppler-shift-compensating system intended primarily for use in transmitter or receiver of laser remote-sensing or communication system to keep frequency of received signal within frequency range of narrow-band-pass filter. By use of narrow-band filter (instead of wide-band filter required in absence of Doppler compensation), signal-to-noise ratio of laser system increased. Thus, less-powerful transmitter usable.

B90-10391**FREQUENCY-TRACKING-ERROR DETECTOR**

RICHARD L. RANDALL (Rockwell International Corp.)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29538**Vol. 14, No. 8, P. 32**

Frequency-tracking-error detector compares average period of output signal from band-pass tracking filter with average period of signal of frequency $100 f(\text{sub } 0)$ that controls center frequency $f(\text{sub } 0)$ of tracking filter. Measures difference between $f(\text{sub } 0)$ and frequency of one of periodic components in output of bearing sensor. Bearing sensor is accelerometer, strain gauge, or deflectometer mounted on bearing housing. Detector part of system of electronic equipment used to measure vibrations in bearings in rotating machinery.

B90-10392**BALL-PASS CAGE-MODULATION DETECTOR**

RICHARD L. RANDALL (Rockwell International Corp.)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29539**Vol. 14, No. 8, P. 32**

Ball-pass cage-modulation detector puts out signal useful in detecting incipient failure of bearing in rotating machine. Part of system of electronic equipment measuring various components of vibrations in such bearings. Bearing sensor - strain gauge or deflectometer on bearing housing - measures deflections of housing as balls pass by. Output of sensor filtered to extract ball-pass cage modulation, indicative of wear in bearing.

B90-10393**SHAFT-ROTATION DETECTOR**

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RICHARD L. RANDALL (Rockwell International Corp.)
Aug. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-29540 Vol. 14, No. 8, P. 33

Signal-processing subsystem generates signal indicative of rotation of shaft from output of accelerometer mounted on housing of bearing supporting shaft. Output of subsystem binary signal at frequency of rotation of shaft. Part of assembly of electronic equipment measuring vibrations in rotating machinery. Accelerometer mounted in such way sensitive to vibrations of shaft perpendicular to axis. Output of accelerometer includes noise and components of vibration at frequencies higher than rotational frequency of shaft.

B90-10394 **FREQUENCY SYNTHESIZER FOR TRACKING FILTER**

RICHARD L. RANDALL (Rockwell International Corp.)
Aug. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-29541 Vol. 14, No. 8, P. 33

Digital frequency-synthesizing subsystem generates trains of pulses, free of jitter, for use as frequency-control signals in tracking filters. Part of assembly of electronic equipment used to measure vibrations in bearings in rotating machinery. Designed to meet requirements for tracking narrow-band cage-rotation and ball-pass components of vibrations, as discussed in 'Frequency-Tracking Error Detector' (MFS-29538) and 'Ball-Pass Cage-Modulation Detector' (MFS-29539). Synthesizer includes preset counter, output of which controls signal for ball-pass filter. Input to this preset counter updated every 2 microseconds: responds almost immediately, effectively eliminating relatively long response time (lock-in time) and phase jitter.

B90-10395 **GENERAL-PURPOSE SERIAL INTERFACE FOR REMOTE CONTROL**

ANTHONY M. BUSQUETS, and LAWRENCE E. GUPTON
Aug. 1990 No additional information available: For specific
technical questions contact TU Officer at Center of origin.

LAR-13739 Vol. 14, No. 8, P. 34

Computer controls remote television camera. General-purpose controller developed to serve as interface between host computer and pan/tilt/zoom/focus functions on series of automated video cameras. Interface port based on 8251 programmable communications-interface circuit configured for tristated outputs, and connects controller system to any host computer with RS-232 input/output (I/O) port. Accepts byte-coded data from host, compares them with prestored codes in read-only memory (ROM), and closes or opens appropriate switches. Six output ports control opening and closing of as many as 48 switches. Operator controls remote television camera by speaking commands, in system including general-purpose controller.

B90-10396 **HUMAN FACTORS IN THE DESIGN OF VIDEO DISPLAYS**

MARY K. KAISER, and DENNIS R. PROFFITT (Virginia Univ.)
Aug. 1990 Additional information available through: NTIS,
Springfield, VA 22161 (Tel:703-487-4650) (N87-20747)'Human-
Display Interactions: Context-Specific Biases.

ARC-11847 Vol. 14, No. 8, P. 34

Good designs take account of perceptual tendencies and conceptual biases in observers. Report presents overview of evolving knowledge of interactions between video displays and human observers. Discusses relative advantages and disadvantages of static and dynamic displays, with attention to human factors combining with characteristics of video-display medium to affect observer's percepts.

B90-10397

ESTIMABILITY AND REGULABILITY OF LINEAR SYSTEMS

YORAM BARAM, and THOMAS KAILATH (Stanford Univ.)
Aug. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

ARC-12173 Vol. 14, No. 8, P. 35

Report presents two new properties of systems characterized by linear state space models (e.g., dynamical systems and associated control systems): estimability and regulability. Provides criteria for reductions of errors and cost functions in control systems. Useful in design of optimal controllers and estimators.

B90-10409

PROGRAM AIDS SIMULATION OF NEURAL NETWORKS

PAUL T. BAFFES

Aug. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MSC-21588 Vol. 14, No. 8, P. 50

Computer program NETS - Tool for Development and Evaluation of Neural Networks - provides simulation of neural-network algorithms plus software environment for development of such algorithms. Enables user to customize patterns of connections between layers of network, and provides features for saving weight values of network, providing for more precise control over learning process. Consists of translating problem into format using input/output pairs, designing network configuration for problem, and finally training network with input/output pairs until acceptable error reached. Written in C.

B90-10446

BUS-PROGRAMMABLE SLAVE CARD

WILLIAM A. HALL (Krug International)

Sep. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MSC-21387 Vol. 14, No. 9, P. 34

Slave microprocessors in multimicroprocessor computing system contains modified circuit cards programmed via bus connecting master processor with slave microprocessors. Enables interactive, microprocessor-based, single-loop control. Confers ability to load and run program from master/slave bus, without need for microprocessor development station. Tristate buffers latch all data and information on status. Slave central processing unit never connected directly to bus.

B90-10447

DIFFERENTIAL RADAR INTERFEROMETRY MAPS CHANGES IN ELEVATION

ANDREW K. GABRIEL (Caltech), RICHARD M. GOLDSTEIN (Caltech), and HOWARD A. ZEBKER (Caltech)

Sep. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

NPO-17831 Vol. 14, No. 9, P. 36

Differential radar interferometry uses data from synthetic-aperture radar (SAR). Three passes of SAR yield three amplitude-and-phase images, from which two interferograms (phase-difference images) made. Interferograms used to make third, 'double-difference' interferogram indicating vertical motion of terrain between passes. Vertical earthquake motions as small as 1 cm detectable. Used to make extensive, accurate maps of such geophysical phenomena as heaving and buckling in fault zones, motions to tectonic plates, residual displacements from earthquakes, motions from prevolcanic swelling, motions of glaciers, tides, and thermal expansion of mountains from diurnal heating.

B90-10448**ROBUST, HIGH-PERFORMANCE CONTROL FOR ROBOTIC MANIPULATORS**

HOMAYOUN SERAJI (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17785**Vol. 14, No. 9, P. 36**

Improved control scheme for robotic manipulators results from alternative approach to use of both model-based and performance-based control techniques. Includes feedforward controller and separate feedback controller. Feedforward controller model-based and contains any known part of dynamics of manipulator used to produce nominal control signal. Feedback controller performance-based; compensates for any unknown dynamics and uncertainties or variations in parameters of manipulator and/or payload.

B90-10449**ACTIVE LIMITERS FOR PHOTODETECTORS**

JOSEPH KATZ (Caltech), and LI-JEN CHENG (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17654**Vol. 14, No. 9, P. 38**

Active or 'smart' electro-optical shutters proposed for protection of photodetectors, imaging devices, and other sensitive optical or optoelectronic elements. Responds rapidly and automatically to increase in illumination above prescribed level.

B90-10450**REAL-TIME DIGITAL COMPRESSION OF TELEVISION IMAGE DATA**

SCOTT P. BARNES, MARY JO SHALKHAUSER, and WAYNE A. WHYTE, JR.

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14945**Vol. 14, No. 9, P. 40**

Digital encoding/decoding system compresses color television image data in real time for transmission at lower data rates and, consequently, lower bandwidths. Implements predictive coding process, in which each picture element (pixel) predicted from values of prior neighboring pixels, and coded transmission expresses difference between actual and predicted current values. Combines differential pulse-code modulation process with non-linear, nonadaptive predictor, nonuniform quantizer, and multilevel Huffman encoder.

B90-10451**CHECKING AUTOMATED-WELDER PROGRAMS BY COMPUTER**

L. O. DAMICONE (Rockwell International Corp.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29006**Vol. 14, No. 9, P. 41**

Computer system detects and displays actual and potential errors in programs for computer-controlled electron-beam welder. Uses personal computer, separate from welding computer. Programmed specifically to highlight errors in welding program. Eliminates need for preweld full-power test run reducing checkout time to about half hour. Assures much higher quality, damage-free welding. Used to create and edit new programs for welder. Control computer thereby free for production. Useful for checking programs for such other computer-controlled equipment as inertia welders, robots, machine tools, and heat treaters.

B90-10452**LASER VELOCIMETRY IN LOW-SPEED WIND TUNNELS**

KENNETH L. ORLOFF, PHILIP K. SNYDER, and MICHAEL S. REINATH

Sep. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N84-16526) 'Laser Velocimetry In The Low-Speed Wind Tunnels At Ames Research Center.'

ARC-11564**Vol. 14, No. 9, P. 42**

Design and performance of three-dimensional and two-dimensional backscatter laser velocimeter, both used in low-speed wind tunnels, described in report together with historical overview of development of laser velocimetry (LV). Provides measurements of airflow in wind-tunnel tests without perturbing effects of probes and probe-supporting structures. Applicable in such related fields as ventilation engineering and possibly in detection of wing vortexes from large aircraft at airports.

B90-10512**DATA-ACQUISITION BOARD FOR IBM PS/2 COMPUTER**

PHUONG-DUNG T. HOANG

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21590**Vol. 14, No. 10, P. 45**

Circuit board containing microprocessors designed to control acquisition of data by IBM PS/2 computer. Plugged into one of 16-bit slots on mother board of computer. Controls transfer of data from as many as 48 discrete channels to Micro Channel Interface. With expansion of software, board recognizes and filters specified kinds of signal patterns, possibly to detect errors.

B90-10513**NEURAL-NETWORK PROCESSOR WOULD ALLOCATE RESOURCES**

SILVIO P. EBERHARDT (Caltech), and ALEXANDER W. MOOPENN (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17781**Vol. 14, No. 10, P. 46**

Global optimization problems solved quickly. Neural-network processor optimizes allocation of M resources among N expenditures according to cost of pairing each resource with each expenditure and subject to limit on number of resources feeding into each expenditure and/or limit on number of expenditures to which each resource allocated. One cell performs several analog and digital functions. Potential applications include assignment of jobs, scheduling, dispatching, and planning of military maneuvers.

B90-10514**AUTOMATED POWER-DISTRIBUTION SYSTEM**

CINDY THOMASON, PAUL M. ANDERSON (Martin Marietta Corp.), and JAMES A. MARTIN (Martin Marietta Corp.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28440**Vol. 14, No. 10, P. 48**

Automated power-distribution system monitors and controls electrical power to modules in network. Handles both 208-V, 20-kHz single-phase alternating current and 120- to 150-V direct current. Power distributed to load modules from power-distribution control units (PDCU's) via subsystem distributors. Ring busses carry power to PDCU's from power source. Needs minimal attention. Detects faults and also protects against them. Potential applications include autonomous land vehicles and automated industrial process systems.

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B90-10515

PROXIMITY SENSORS MAKE ROBOT DEXTEROUS

CLIFF HESS, and LARRY C. H. LI

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21476

Vol. 14, No. 10, P. 50

Control system enables robot hand to grasp objects of varied shapes. Key features of system: reflective proximity sensors furnishing data on position, orientation, and distance of object and software protocol controlling sequence of operations in approaching and grasping objects. Reflected-beam sensing concept applied to simple opposed-jaw industrial grippers as well as to dexterous robot hands.

B90-10516

MASTER/PROGRAMMABLE-SLAVE COMPUTER

DAVID SMAISTRLA (Krug International), and WILLIAM A. HALL (Krug International)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21550

Vol. 14, No. 10, P. 50

Unique modular computer features compactness, low power, mass storage of data, multiprocessing, and choice of various input/output modes. Master processor communicates with user via usual keyboard and video display terminal. Coordinates operations of as many as 24 slave processors, each dedicated to different experiment. Each slave circuit card includes slave microprocessor and assortment of input/output circuits for communication with external equipment, with master processor, and with other slave processors. Adaptable to industrial process control with selectable degrees of automatic control, automatic and/or manual monitoring, and manual intervention.

B90-10517

MICROPROCESSOR CONTROL FOR LIQUID-COOLED

GARMENT

CHARLES S. WEAVER (SRI International)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21359

Vol. 14, No. 10, P. 52

Automatic control system maintains temperature of water-cooled garment within comfort zone while wearer's level of physical activity varies. Uncomfortable overshoots and undershoots of temperature eliminated. Designed for use in space suit, adaptable to other protective garments and to enclosed environments operating according to similar principles.

B90-10518

ULTRASONIC IMAGING OF DEEP ARTERIES

JAMES A. ROONEY (Caltech), RICHARD C. HEYSER (Caltech), and DENNIS H. LECROISSETTE (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17439

Vol. 14, No. 10, P. 54

Swept-frequency sound replaces pulsed sound. Ultrasonic medical instrument produces images of peripheral and coronary arteries with resolutions higher and at depths greater than attainable by previous ultrasonic systems. Time-delay-spectrometry imager includes scanning, image-processing, and displaying equipment. It sweeps in frequency from 0 to 10 MHz in 20 ms, pauses for 5 ms, and repeats sweep. Intended for use in noninvasive detection and measurement of atherosclerotic lesions.

B90-10519

TIME-RESOLVED MEASUREMENTS OF LASER FAR-FIELD PATTERNS

KATHRINE FORREST, and DONALD CORNWELL

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13338

Vol. 14, No. 10, P. 55

Computer-controlled scanning photometric instrumentation system measures intensity pattern in far field of pulsed laser as function of time during each pulse (provided that pulse is at least 1 ns long). Such measurements important in studying dynamics of laser operation: they reveal such previously unobservable phenomena as oscillations of undesired spatial modes of radiation pattern during pulse, steering of beam during pulse, and instability of intensity of laser beam. Principal advantages of system are its relatively low cost and its ability to function under normal lighting conditions without incurring damage.

B90-10520

NONCOHERENT COMBINATION OF OPTICAL-HETERODYNE OUTPUTS

CHIEN-CHUNG CHEN (Caltech), and JAMES R. LESH (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17693

Vol. 14, No. 10, P. 55

In proposed scheme for reception of amplitude- or frequency-modulated signals transmitted optically through atmosphere, main receiver aperture divided into subapertures equipped with receivers, and outputs of receivers combined noncoherently. Multiple subaperture receivers used instead of attempting to focus all light from single large aperture onto one receiver. Outputs of receivers combined after demodulation. System will not perform as well as fully coherent system, but surpasses single-large-aperture system in presence of atmospheric turbulence. Offers superior performance in presence of distorted wavefront and/or imperfect receiver optics.

B90-10521

TESTS OF A DIFFERENTIAL GLOBAL POSITIONING SYSTEM

F. G. EDWARDS, D. M. HEGARY, R. N. TURNER (Ohio Univ.), F. VAN GRAAS (Ohio Univ.), and S. SHARMA (Ohio Univ.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12313

Vol. 14, No. 10, P. 56

Paper describes validation tests of global positioning system (GPS) for low-flying helicopters. Configured as differential GPS, in which components in both aircraft and ground station compute position errors relative to known location using satellite navigational data. Corrections computed from differences between computed and measured ranges to four satellites being tracked by receiver in both aircraft and ground systems. Tests conducted to determine whether equipment and computer programs of system operated correctly and consistently.

B90-10522

STUDY OF ADAPTIVE-ARRAY SIGNAL PROCESSING

EDGAR H. SATORIUS (Caltech), and LLOYD GRIFFITHS (University of Southern California)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17492

Vol. 14, No. 10, P. 57

Report describes study of adaptive signal-processing techniques for suppression of mutual satellite interference in mobile (on ground)/satellite communication system. Presents analyses and numerical simulations of performances of two approaches to signal processing for suppression of interference. One approach, known

as 'adaptive side lobe canceling', second called 'adaptive temporal processing'.

B90-10570

IMPROVED 'SMART' ROBOT HAND

ZOLTAN F. SZAKALY (Caltech), ZOLTAN VIGH (Caltech), ANTAL BEJCZY (Caltech), and TIMOTHY OHM (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17917

Vol. 14, No. 11, P. 38

Improved version of developmental 'smart' robot hand equipped with bidirectional, wide-band optical-fiber link for transmission of digitized strain-gauge force- and torque-sensor signals from hand and for transmission of command signals to motor drive unit on hand. Collection of sensor data speeded hundredfold. Higher data-collection speed makes possible to perform advanced processing of sensor data in host processor.

B90-10571

SYSTEM PREDICTS CRITICAL RUNWAY PERFORMANCE PARAMETERS

ERNEST W. MILLEN, and LEE H. PERSON, JR.

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13809

Vol. 14, No. 11, P. 40

Runway-navigation-monitor (RNM) and critical-distances-process electronic equipment designed to provide pilot with timely and reliable predictive navigation information relating to takeoff, landing and runway-turnoff operations. Enables pilot to make critical decisions about runway maneuvers with high confidence during emergencies. Utilizes ground-referenced position data only to drive purely navigational monitor system independent of statuses of systems in aircraft.

B90-10572

FAST FEATURE-RECOGNIZING OPTOELECTRONIC SYSTEM

S. THAKOOR (Caltech), and A. P. THAKOOR (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17690

Vol. 14, No. 11, P. 42

Proposed optoelectronic system recognizes features or classifies images by processing outputs of photosensors rapidly, in parallel, through circuits developed in research on neural networks. Array of photoconductive elements serve as photomodulated connections in electronic neural network, which provides high speed data compression to generate feature vector. System able to 'learn' new patterns for subsequent recognition. Potential applications in robotic vision systems and pattern recognition.

B90-10573

THREE-ZONE PROGRAMMABLE TEMPERATURE CONTROLLER

GUY A. SMITH (Alabama Univ.), and L. WORKMAN (Alabama Univ.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28435

Vol. 14, No. 11, P. 44

Microprocessor-based controller regulates electrical power supplied to heater in each zone of three-zone directional-solidification furnace. Intended primarily for use in microgravity experiments aboard KC-135 airplane, controller also used on ground. Offers advantage of low electrical noise and consequent minimal interference with low-level signals put out by thermocouples and other sensors used in experiments. Achieved

by heating with direct (instead of alternating) current and not pulsing heating current.

B90-10574

TEST BED FOR TELEROBOTS

JACOB R. MATIJEVIC (Caltech), WAYNE F. ZIMMERMAN (Caltech), and SHLOMO DOLINSKY (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17898

Vol. 14, No. 11, P. 46

Assembly of electromechanical and electronic equipment (including computers) constitutes test bed for development of advanced robotic systems for remote manipulation. Combines features not found in commercial systems. Its architecture allows easy growth in complexity and level of automation. System national resource for validation of new telerobotic technology. Intended primarily for robots used in outer space, test bed adapted to development of advanced terrestrial telerobotic systems for handling radioactive materials, dangerous chemicals, and explosives.

B90-10575

EVALUATION OF AN AIRCRAFT-COLLISION-AVOIDANCE SYSTEM

SHERYL L. CHAPPELL, CHARLES E. BILLINGS, M. CHRISTINE OLSEN, BARRY C. SCOTT (Federal Aviation Administration), ROBERT J. TUTTLE (Naval Postgraduate School), and THOMAS E. KOZON (Sterling Software)

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-18037)

ARC-12367

Vol. 14, No. 11, P. 47

Report describes study of pilots' use of traffic alert and collision-avoidance system (TCAS II) in simulated airplane flights. Gives alert by light and sound when another aircraft within 40 s of passing very closely. If other aircraft still poses threat 15 to 20 s later, TCAS II advises pilot to maneuver vertically or to continue on same flightpath but alter rate of ascent or descent. Report describes methodology, summarizes results, and presents conclusions.

B90-10576

DETAILS OF COLLISION-AVOIDANCE STUDY

SHERYL L. CHAPPELL, CHARLES E. BILLINGS, M. CHRISTINE OLSEN, BARRY C. SCOTT (Federal Aviation Administration), ROBERT J. TUTTLE (Naval Postgraduate School), and THOMAS E. KOZON (Sterling Software)

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-18038)

ARC-12396

Vol. 14, No. 11, P. 48

Report provides background information on and detailed description of study of pilots' use of traffic-alert and collision-avoidance system (TCAS II) in simulated flights. Described in article, 'Evaluation of an Aircraft-Collision-Avoidance System' (ARC-12367). Plans, forms, training narratives, scripts, questionnaires, and other information compiled.

B90-10621

NEURAL NETWORK SOLVES 'TRAVELING-SALESMAN' PROBLEM

ANILKUMAR P. THAKOOR (Caltech), and ALEXANDER W. MOOPENN (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17807

Vol. 14, No. 12, P. 22

Experimental electronic neural network solves 'traveling-salesman' problem. Plans round trip of minimum distance among N cities, visiting every city once and only once (without

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backtracking). This problem is paradigm of many problems of global optimization (e.g., routing or allocation of resources) occurring in industry, business, and government. Applied to large number of cities (or resources), circuits of this kind expected to solve problem faster and more cheaply.

B90-10622

ADAPTIVE NEURONS FOR ARTIFICIAL NEURAL NETWORKS

RAOUL TAWEL (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17803

Vol. 14, No. 12, P. 24

Training time decreases dramatically. In improved mathematical model of neural-network processor, temperature of neurons (in addition to connection strengths, also called weights, of synapses) varied during supervised-learning phase of operation according to mathematical formalism and not heuristic rule. Evidence that biological neural networks also process information at neuronal level.

B90-10623

SCSI COMMUNICATION TEST BUS

CHANH V. HUA (International Business Machines Corp.), JOHN J. D'AMBROSE (International Business Machines Corp.), RICHARD C. JAWORSKI (International Business Machines Corp.), ELAINE M. HALULA (International Business Machines Corp.), DAVID N. THORNTON (International Business Machines Corp.), ROBERT L. HELIGMAN (International Business Machines Corp.), and MICHAEL R. TURNER (International Business Machines Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21704

Vol. 14, No. 12, P. 25

Small Computer System Interface (SCSI) communication test bus provides high-data-rate, standard interconnection enabling communication among International Business Machines (IBM) Personal System/2 Micro Channel, other devices connected to Micro Channel, test equipment, and host computer. Serves primarily as nonintrusive input/output attachment to PS/2 Micro Channel bus, providing rapid communication for debugger. Opens up possibility of using debugger in real-time applications.

B90-10624

CONTROLLING GAS-FLOW MASS RATIOS

BRIAN G. MORRIS

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21542

Vol. 14, No. 12, P. 26

Proposed system automatically controls proportions of gases flowing in supply lines. Conceived for control of oxidizer-to-fuel ratio in new gaseous-propellant rocket engines. Gas-flow control system measures temperatures and pressures at various points. From data, calculates control voltages for electronic pressure regulators for oxygen and hydrogen. System includes commercially available components. Applicable to control of mass ratios in such gaseous industrial processes as chemical-vapor deposition of semiconductor materials and in automotive engines operating on compressed natural gas.

B90-10639

ANALYZING DISTRIBUTED PROCESSING FOR ELECTRIC UTILITIES

STANLEY A. KLEIN (Caltech), HAROLD KIRKHAM (Caltech), and JULIE A. BEARDMORE (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-17710

Vol. 14, No. 12, P. 38

Distributed Processing Trade-Off Model for Electric Utility Operation computer program based upon study performed at California Institute of Technology for NASA's Jet Propulsion Laboratory. Study presented technique addressing question of tradeoffs between expanding communications network or expanding capacity of distributed computers in energy-management systems (EMS) of electric utility. Gives EMS planners macroscopic tool for evaluation of architectures of distributed-processing systems and major technical and economic tradeoffs as well as interactions within systems.

B90-10640

LOCAL-AREA-NETWORK SIMULATOR

JIM GIBSON, JOE JORDAN, and TERRY GRANT

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12168

Vol. 14, No. 12, P. 38

Local Area Network Extensible Simulator (LANES) computer program provides method for simulating performance of high-speed local-area-network (LAN) technology. Developed as design and analysis software tool for networking computers on board proposed Space Station. Load, network, link, and physical layers of layered network architecture all modeled. Mathematically models according to different lower-layer protocols: Fiber Distributed Data Interface (FDDI) and Star*Bus. Written in FORTRAN 77.

B90-10641

SOFTWARE FOR THREE-DIMENSIONAL SPACE-SHUTTLE IMAGERY

ERNEST J. PITTARELLI (Computer Sciences Corp.), MICHELE LANGREHR (Computer Sciences Corp.), GLENN TAMKIN (Computer Sciences Corp.), GARY HUNT (Computer Sciences Corp.), ROBERT DURBECK (Computer Sciences Corp.), DAVID GREEN (Computer Sciences Corp.), and JAMES JELETIC

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13246

Vol. 14, No. 12, P. 38

Flight Dynamics/Space Transportation System Three-Dimensional Monitor System (3-D Mon) is real-time graphical mission-monitoring software tool. Main objective to compute and display realistic three-dimensional solid model image of Space Shuttle, remote-manipulator system, payload, and surroundings from real-time Space Shuttle telemetry data. Ability to support spacecraft other than Space Shuttle also incorporated. Display shows almost any desired perspective. Written in C programming language.

B90-10642

DATA-MANAGEMENT SOFTWARE FOR PIFEX

ANIL V. KANTAK (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17463

Vol. 14, No. 12, P. 39

UNIX Based Data Management System is collection of computer programs for use in Pilot Field Experiment (PiFEx), which attempts to mimic mobile/satellite-communications (MSAT) scenario. Major purposes to define mobile-communications channels and test workability of new concepts used to design various components of receiver system. Results, large amounts of raw data that must be retrieved according to researcher's needs. Intended to manage PiFEx data in interactive way. Written in either FORTRAN-77 or UNIX shell-scripts.

B90-10650**OPTIMAL REGULATOR ALGORITHMS FOR THE CONTROL OF LINEAR SYSTEMS (ORACLS)**

HAROLD P. FRISCH

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13067**Vol. 14, No. 12, P. 44**

Control theory design package offers engineer full range of subroutines to manipulate and solve Linear-Quadratic-Gaussian types of problems. ORACLS is rigorous tool, intended for multi-input and multi-output dynamic systems in both continuous and discrete form. Written in FORTRAN.

B90-10655**NEURAL NETWORK DEVELOPMENT TOOL (NETS)**

PAUL T. BAFFES

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21588**Vol. 14, No. 12, P. 44**

Artificial neural networks formed from hundreds or thousands of simulated neurons, connected in manner similar to that in human brain. Such network models learning behavior. Using NETS involves translating problem to be solved into input/output pairs, designing network configuration, and training network. Written in C.

03 PHYSICAL SCIENCES**B86-10029****SEEBECK COEFFICIENT MEASURED WITH DIFFERENTIAL HEAT PULSES**

L. ZOLTAN (Caltech), C. WOOD (Caltech), and G. STAPFER (Caltech)

Jun. 1986

NPO-16506**Vol. 10, No. 1, P. 70**

Common experimental errors reduced because pulse technique suppresses drifts in thermoelectric measurements. Differential-heat-pulse apparatus measures Seebeck coefficient in semiconductors at temperatures up to 1,900 K. Sample heated to measuring temperature in furnace. Ends of sample then differentially heated a few degrees more by lamps. Differential temperature rise and consequent Seebeck voltage measured via thermocouple leads. Because pulse technique used, errors that often arise from long-term drifts in thermoelectric measurements suppressed. Apparatus works with temperature differences of only few degrees, further increasing accuracy of coefficients obtained.

B86-10030**BREWSTER-PLATE SPOILER FOR LASER SPECTROMETER**

C. R. WEBSTER (Caltech)

Jun. 1986

NPO-16567**Vol. 10, No. 1, P. 72**

Oscillating Brewster plate reduces effects of unwanted interference fringes on absorption-spectroscopic measurements obtained with tuned diode lasers. Plate modulates optical-path length past several resonance peaks causing interference fringes to pass by rapidly and become blurred. Thus, fringe effects averaged out over time. Technique used at other wavelengths

from ultraviolet to infrared and in spectrometers with short or long optical paths, including those with retroreflectors or multipass cells.

B86-10031**TEST METHOD FOR X-RAY TELESCOPES**

D. KORSCH (Korsch Optics, Inc.)

Jun. 1986

MFS-26020**Vol. 10, No. 1, P. 75**

Telescopes and X-ray telescopes in particular, tested with nearby point sources of radiation. When point-source rays enter telescope through annular entrance pupil (and under conditions of spherical aberration), ring image produced. Deviation of ring image from perfect circular shape reveals misalignments and surface inaccuracies in telescope. Although particularly suited for grazing-incidence types of systems, this test method applied to other types of optical systems.

B86-10032**MICROWAVE POWER FROM NATURAL EMITTERS**

J. M. STACEY (Caltech)

Jun. 1986

NPO-16581**Vol. 10, No. 1, P. 77**

Signal-to-noise ratio of radiometer system calculated. Publication from NASA's Jet Propulsion Laboratory presents calculations of power radiated from natural emitter on Earth to microwave collecting aperture on aircraft or spacecraft. Analysis develops power-transfer criteria for detection of emitting object by collecting aperture (that is, by antenna and its receiver). Resulting formulas used in design of radiometer systems.

B86-10033**DEFORMABLE SUBREFLECTOR COMPUTED BY GEOMETRIC OPTICS**

W. F. WILLIAMS (Caltech)

Jun. 1986

NPO-16405**Vol. 10, No. 1, P. 78**

Distorted antenna surfaces forced to produce a uniform wave front. SUBFORMING employs geometric optics in determining subreflector coordinates to match main reflector surface with known distortions. Antenna with distorted paraboloidal reflecting surface forced to produce uniform wave front by using a Cassegrainian geometry with path-length-compensating subreflector. Program written in FORTRAN V for batch execution.

B86-10034**COMPUTING COMPOSITION/DEPTH PROFILES FROM X-RAY DIFFRACTION**

K. E. WIEDEMANN (Analytical Services and Materials, Inc.), and J. UNNAM

Jun. 1986

LAR-13356**Vol. 10, No. 1, P. 78**

Diffraction-intensity bands deconvolved relatively quickly. TIBAC constructs composition/depth profiles from X-ray diffraction-intensity bands. Intensity band extremely sensitive to shape of composition/depth profile. TIBAC incorporates straightforward transformation of intensity band that retains accuracy of earlier simulation models, but is several orders of magnitude faster in total computational time. TIBAC written in FORTRAN 77 for batch execution.

B86-10035**THERMODYNAMIC CALCULATIONS FOR COMPLEX CHEMICAL MIXTURES**

B. J. MCBRIDE

Jun. 1986

LEW-14166**Vol. 10, No. 1, P. 79**

General computer program, CECTRP, developed for calculation of thermodynamic properties of complex mixtures with option to

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calculate transport properties of these mixtures. Free-energy minimization technique used in equilibrium calculation. Rigorous equations used in transport calculations. Program calculates equilibrium compositions and corresponding thermodynamic and transport properties of mixtures. CECTRP accommodates up to 24 reactants, 20 elements, and 600 products, 400 of which are condensed. Written in FORTRAN IV for any large computer system.

B86-10118

HEAT-PIPE ARRAY FOR LARGE-AREA COOLING

F. EDELSTEIN (Grumman Aerospace Corp.), and R. F. BROWN (Grumman Aerospace Corp.)

May 1986

MSC-20946

Vol. 10, No. 2, P. 64

High rates of heat transfer anticipated. Prototype evaporative cold plate gathers waste heat from equipment mounted on it. Plate made by welding together flanges of several sections of heat pipe. Since plate separates liquid and vapor phases at inlet and outlet ports, eliminates complexities and uncertainties of two-phase flow in zero gravity. On earth, inlet valve enables plate to operate at relatively-large height differences with other plates in same system.

B86-10119

HIGH-FLUX ATOMIC-OXYGEN SOURCE

A. CHUTJIAN (Caltech), and O. ORIENT (Caltech)

May 1986

NPO-16640

Vol. 10, No. 2, P. 66

Beams of pure ground-state oxygen atoms produced. Accelerated electrons strike beam of O₂ gas in dissociative-attachment region, producing O⁻ ions. O⁻ ions accelerated to desired final energy and pass through photodetachment region to form O(3P) atoms. These pass between electric field plates to remove O⁻ and e and strike target. Designed specifically to study degradation of materials and spacecraft glow phenomena in low Earth orbits, used to study gas-phase collision phenomena involving energetic oxygen atoms.

B86-10120

PARTIAL-TRANSMISSION SCINTILLATION DETECTOR FOR IONS

C. J. MALONE (Caltech), and J. A. ZOUTENDYK (Caltech)

May 1986

NPO-16501

Vol. 10, No. 2, P. 68

Only outer portion of ion beam sampled to prevent unnecessary energy losses. Measurement device allows only periphery of beam to pass through scintillation material. Total flux in uniform beam inferred from peripheral flux. Device provides readings without reducing energy of ions in middle of beam. Measurement device developed for ion beams used in studies of how fast heavy ions affect integrated-circuit chips.

B86-10121

SOLID-SORBENT AIR SAMPLER

T. J. GALEN (Northrop Services, Inc.)

May 1986

MSC-20653

Vol. 10, No. 2, P. 68

Portable unit takes eight 24-hour samples. Volatile organic compounds in air collected for analysis by portable, self-contained sampling apparatus. Sampled air drawn through sorbent material, commercial porous polymer of 2, 3-diphenyl-p-phenylene oxide. High-boiling-point organic compounds adsorbed onto polymer, while low-boiling-point organics pass through and returned to atmosphere. Sampler includes eight sample tubes filled with polymeric sorbent. Organic compounds in atmosphere absorbed when air pumped through sorbent. Designed for checking air in spacecraft, sampler adaptable to other applications as leak detection, gas-mixture analysis, and ambient-air monitoring.

B86-10122

MAPPING THE STRUCTURE OF HETEROGENEOUS MATERIALS

L. D. STRAND (Caltech), N. S. COHEN (Caltech), and M. A. HERNAN (Caltech)

May 1986

NPO-16487

Vol. 10, No. 2, P. 70

Image-processing microdensitometer/Fourier analyzer yields statistics of subcomponent distribution. Nondestructive method for studying structure heterogeneous materials uses energy-dispersive X-ray analysis in scanning electron microscope. Scanning microdensitometer/Fourier analyzer (SMFA) is applied to SEM images to obtain statistics about sample structure. Method originally developed for studying effect on combustion of fine structure of composite solid propellants.

B86-10123

ELECTRO-OPTICAL TUNING OF FABRY-PEROT INTERFEROMETERS

G. K. SCHWEMMER

May 1986

GSC-12971

Vol. 10, No. 2, P. 72

Compact unit operates much faster than conventional piezoelectric scanners. High voltage creates electric field in Pockels cell, changing refractive properties. Cell changes optical path length between mirrors without mechanically moving anything in gap. High voltage varied rapidly to scan interferometer. Voltage applied longitudinally or transversely, depending on type of Pockels cell. New electro-optic scanner scans given range in one-millionth time of piezoelectric scanner - tens to hundreds of nanoseconds per interferometer order. Also reducing size of interferometer.

B86-10124

RECORDING INTERFEROGRAMS HOLOGRAPHICALLY

E. R. COMEENS (TAI Corp.), and R. L. KURTZ (TAI Corp.)

May 1986

MFS-26024

Vol. 10, No. 2, P. 74

Images of experiments stored for later analysis. Classical interferometer modified for holography by removing entrance semireflecting mirror and inserting holographic recording in one of legs. Collimated laser beam projected through hologram and directed to remaining semitransparent mirror. Combines with reference beam from same laser to form virtual image of original experiment. Developed for experiments on crystal growth during space flights. Images recorded rapidly under constraints of experiments and later examined on ground.

B86-10125

COMPARATIVE THERMAL-CONDUCTIVITY TEST TECHNIQUE

C. N. WEBSTER (LTV Aerospace Corp.), and J. K. WILLIS (LTV Aerospace Corp.)

May 1986

MSC-20980

Vol. 10, No. 2, P. 75

Approximate thermal conductivities determined rapidly. Two specimens, to be compared, placed in assembly with insulation. One end of assembly placed in furnace. Temperature of furnace, of each end, and of center of each specimen recorded. Procedure used to rate quickly candidate materials for applications in which thermal conductivity prime consideration.

B86-10126

THREE-DIMENSIONAL RADIATIVE-TRANSFER EQUATION

J. V. MARTONCHIK (Caltech), and D. J. DINER (Caltech)

May 1986

NPO-16563

Vol. 10, No. 2, P. 76

Progress made toward interpretation of radiometric observations. Paper discusses equation of radiative transfer in three-dimensional, inhomogeneous, scattering medium illuminated

from above and bounded below by laterally inhomogeneous, reflective plane. Representation of radiation field with full three-dimensional variability derived by use of spatial Fourier transform and matrix-operator techniques developed previously for one-dimensional version of problem. Equations useful for radiometric measurements from aircraft and spacecraft. Although derivations and resulting equations complicated, use of Fourier-transform, matrix-operator approach to solve practical problems simpler than direct solution of complete three-dimensional, linear wave equations.

B86-10216

ECHELLE/GRISM SPECTROGRAPH

A. A. DANTZLER

May 1986

GSC-12977

Vol. 10, No. 3, P.54

More even spectral dispersion over detector area makes all wavelengths more distinguishable. Proposed echelle spectrograph includes grating/prism combination, called 'grism,' to make spectral dispersion over detector more even than usually in such instruments. Instrument performance improved, with little additional manufacturing effort. Furthermore, since grism placed within collimated light and its faces are optically flat, introduces no aberrations into optical system.

B86-10217

VACUUM-ULTRAVIOLET INTENSITY-CALIBRATION STANDARD

J. M. AJELLO (Caltech), and B. O. FRANKLIN (Caltech)

May 1986

NPO-16621

Vol. 10, No. 3, P. 56

Portable light source enables calibration of spectrometers. Vacuum Ultraviolet Light (40 to 200 nm) produced in electron-impact emission chamber by leading beam of gas across electron beam. Photons observed at right angles to electron-beam axis. Previously, there were blackbody standards in visible and near ultraviolet, but no intensity-calibration standards in VUV.

B86-10218

MEASURING SEEBECK COEFFICIENTS WITH LARGE THERMAL GRADIENTS

C. WOOD (Caltech), A. CHMIELEWSKI (Caltech), and L. D. ZOLTAN (Caltech)

May 1986

NPO-16667

Vol. 10, No. 3, P. 57

Apparatus takes measurements and analyzes data automatically. Cylindrical sample is pressed between heater and water-cooled baseplate. Thermocouples at opposite ends of sample provide both temperatures and Seebeck voltages. Conveniently shaped samples used, and results calculated by microcomputer and printed out.

B86-10219

SUNLIGHT SIMULATOR FOR PHOTOVOLTAIC TESTING

R. L. MUELLER (Caltech)

May 1986

NPO-16696

Vol. 10, No. 3, P. 58

Light with normalized spectral irradiance resembling that of air mass 1.5 sunlight striking surface of Earth produced by use of ultraviolet filter to modify output of set of flashlamps used as large-area pulsed solar simulator (LAPSS). Filtered LAPSS light allows more realistic measurements of output of photovoltaic devices when using silicon reference cell having different spectral response characteristic.

B86-10220

ELECTRON-DIFFRACTION ANALYSIS OF GROWTH OF GAAS

B. F. LEWIS (Caltech), F. J. GRUNTHANER (Caltech), A. MADHUKAR (Caltech), T. C. LEE (Caltech), and R. FERNANDEZ (Caltech)

May 1986

NPO-16755

Vol. 10, No. 3, P. 59

Report describes experiments that used reflection high-energy-electron diffraction (RHEED) to investigate behavior of GaAs surfaces during and after growth by molecular-beam epitaxy (MBE). Experimental results show dynamic RHEED measurements useful both as probes of surface and growth kinetics and as methods for determining and reproducing surface and growth conditions.

B86-10234

PREDICTING THE COSMIC-RAY ENVIRONMENT NEAR EARTH

L. EDMONDS

May 1986

NPO-16617

Vol. 10, No. 3, P. 78

Package of computer programs developed to predict cosmic-ray environment for spacecraft in orbit near Earth. Single cosmic-ray particle deposits enough electrical charge on sensitive area of individual circuit to change bit state. Single-event upsets may not cause permanent damage but upset functioning devices. Used to predict upset rate for space mission. Also calculates time-average cosmic-ray environment for multiple circular orbits, fragments of trajectories, and isolated points. Package written in HPL for interactive execution and implemented on HP 9825B desktop computer.

B86-10325

INTERFEROMETER FOR OBSERVING COMPRESSIBLE FLOW

W. BACNALO (Aerometric, Inc.), and M. HOUSER (Aerometrics, Inc.)

Jul. 1986

ARC-11549

Vol. 10, No. 4, P. 60

Moving pictures show changing flow-field contours. Optical interferometer enables instantaneous visualization of compressible fluid flows. Relatively immune to vibration, unit suited to observation of flows over models in large wind tunnels. In improved point-diffraction interferometer, reference beam generated by pinhole (point) diffraction at place in object beam outside experimental volume. Object under test positioned so interior or supporting stand lies in shadows of turning mirrors.

B86-10326

ULTRASONIC VERIFICATION OF METAL-GRAIN SIZE

E. R. GENERAZIO

Jul. 1986 See Also N84-32849/NSP

LEW-14283

Vol. 10, No. 4, P. 61

Ultrasonic attenuation as function of frequency determined for metal sample having known mean grain diameter. Once function determined for one sample of material, scaled to determine mean grain size of other samples of materials. Results suggest ultrasonic approach viable for verifying effects of heat treatments that vary grain size. Uses of this technology include nondestructive ultrasonic verification size heat treatments and other online inspection systems.

B86-10327

SOLAR-POWERED WATER ELECTROLYZER

OMAR J. HANCOCK, JR. (Florida Solar Energy Center)

Jul. 1986

KSC-11297

Vol. 10, No. 4, P. 61

Electrolyzer produces hydrogen and oxygen from water using solar photovoltaic electricity directly, without conditioning. Hydrogen used as energy-storage medium to be burned when needed to generate heat or electricity for domestic use.

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B86-10328

ELLIPSO-METRIC MONITORING OF FILM DEPOSITION

D. B. BICKLER (Caltech)

Jul. 1986

NPO-16791

Vol. 10, No. 4, P. 62

Impurities detected nondestructively during processing. In proposed system, surface of growing amorphous-silicon film monitored by ellipsometer at wavelength or combination of wavelengths at which impurity or impurities of interest absorb light strongly.

B86-10329

CONVECTION IN A SOLIDIFYING BINARY MIXTURE

B. ANTAR (University of Tennessee), and F. COLLINS (University of Tennessee)

Jul. 1986

MFS-27092

Vol. 10, No. 4, P. 63

Temperature and concentration profiles calculated. Study expands on earlier work including more realistic, mathematically complicating physical effects and yet retains simple geometry and enough simplifying assumptions to make equations solvable. Leads to improved understanding of metal and glass production, material processing in low low gravity other important material processing problems.

B86-10430

INCREASING THE DEPOSITION RATE OF SILICON

R. LUTWACK (Caltech), and K. A. YAMAKAWA (Caltech)

Sep. 1986

NPO-15911

Vol. 10, No. 5, P. 62

Modified Siemens reactor enables chemical vapor deposition (CVD) of silicon to occur simultaneously on inner and outer surfaces of hollow cylinder, resulting in increase in mass of silicon deposited per unit time. Outer reactor for silicon deposition made from quartz or stainless steel. Hollow cylinder either single resistance-heated hollow cylinder about 5 to 10 cm or greater in diameter or 1-cm-diameter rods aligned in circular channels at top and bottom, initial circles being 5 to 10 cm in diameter or greater.

B86-10431

TANDEM-MIRROR ION SOURCE

A. BIDDLE, N. STONE, D. REASONER, W. CHISHOLM, and J. REYNOLDS

Sep. 1986

MFS-28122

Vol. 10, No. 5, P. 63

Improved ion source produces beam of ions at any kinetic energy from 1 to 1,000 eV, with little spread in energy or angle. Such ion beams useful in studies of surface properties of materials, surface etching, deposition, and development of plasma-diagnostic instrumentation. Tandem-mirror ion source uses electrostatic and magnetic fields to keep electrons in ionization chamber and assure uniform output ion beam having low divergence in energy and angle.

B86-10432

FIELD FUNNELING AND RANGE STRAGGLING IN SILICON DETECTORS

J. A. ZOUTENDYK (Caltech), and C. J. MALONE (Caltech)

Sep. 1986

NPO-16584

Vol. 10, No. 5, P. 64

Magnitudes of field funneling and range straggling determined in silicon-surface-barrier (Schottky-barrier) charged-particle detectors (SSBD's) through measurement of charges collected from alpha-particle tracks. Method used extended to straightforward measurement of charge collection from heavy-ion tracks in these and other semiconductor devices. Such measurements used to assess single-event upsets in integrated-circuit chips, with view toward making them resistant to radiation. Field funneling and

range straggling measured with electronic system in which charge collected from individual ions measured and recorded by multichannel analyzer.

B86-10433

ESTIMATING MICROWAVE DELAY BY ATMOSPHERIC WATER

S. E. ROBINSON (Caltech)

Sep. 1986

NPO-16642

Vol. 10, No. 5, P. 68

Tropospheric path delays for microwave very-long-baseline interferometry (VLBI) estimated with algorithm that determines and explicitly integrates simple water-vapor distribution based on temperature data from water-vapor radiometer (WVR) and emission model. Although computationally complex, method readily accommodates even dramatic changes in observation conditions, emission model, and WVR equipment. Algorithm accommodates changes in observation conditions, emission model, and radiometer hardware.

B86-10434

MEASURING SODIUM CHLORIDE CONTENTS OF AEROSOLS

M. P. SINHA (Caltech), and S. K. FRIEDLANDER (Caltech)

Sep. 1986

NPO-16722

Vol. 10, No. 5, P. 69

Amount of sodium chloride in individual aerosol particles measured in real time by analyzer that includes mass spectrometer. Analyzer used to determine mass distributions of active agents in therapeutic or diagnostic aerosols derived from saline solutions and in analyzing ocean spray. Aerosol particles composed of sodium chloride introduced into oven, where individually vaporized on hot wall. Vapor molecules thermally dissociated, and some of resulting sodium atoms ionized on wall. Ions leave oven in burst and analyzed by spectrometer, which is set to monitor sodium-ion intensity.

B86-10435

QUIET PLASMA SOURCE

P. L. LEUNG (Caltech)

Sep. 1986

NPO-16215

Vol. 10, No. 5, P. 69

Synthesis of plasma from separate ion and electron emitters suppresses electromagnetic interference. Source employs separate emitters for electrons and ions. Plasma source used to simulate variety of astrophysical phenomena and space-plasma effects. For example, used in studies of propagation of electromagnetic waves in plasmas. Serves as interference-free charge neutralizer.

B86-10436

MEASURING COMBUSTION ADVANCE IN SOLID PROPELLANTS

L. C. YANG (Caltech)

Sep. 1986

NPO-16585

Vol. 10, No. 5, P. 70

Set of gauges on solid-propellant rocket motor with electrically insulating case measures advance of combustion front and local erosion rates of propellant and insulation. Data furnished by gauges aid in motor design, failure analysis, and performance prediction. Technique useful in determining propellant uniformity and electrical properties of exhaust plume. Gauges used both in flight and on ground. Foilgauge technique also useful in basic research on pulsed plasmas or combustion of solids.

B86-10437

DETERMINING MONTHLY MEAN HUMIDITIES FROM SATELLITE DATA

W. Y. T. LIU (Caltech), and P. P. NIILER (Caltech)

Sep. 1986

NPO-16529**Vol. 10, No. 5, P. 72**

Report describes statistical study to estimate monthly average humidity of marine surface layer of atmosphere from measurements by radiometers on satellites. Study part of continuing effort to determine flux density of latent heat due to evaporation at ocean surface. Such observations and measurements important because latent-heat flux affects weather and temperature and salinity of upper ocean layers.

B86-10438**REFLECTIVE SHIELDS FOR ARTIFICIAL SATELLITES**

F. L. BOUQUET (Caltech)

Sep. 1986

NPO-16428**Vol. 10, No. 5, P. 72**

Report proposes reflective shield that protects spacecraft from radiant energy. Also gives some protection against particle beams and cosmic rays. Conceptual shield essentially advanced version of decorative multifaceted mirror balls often hung over dance floors. Mirror facets disperse radiant energy in many directions.

B86-10489**PHOTOCURRENT IMAGING DETECTS SOLAR-MODULE DEFECTS**

Q. KIM (Caltech), A. SHUMKA (Caltech), and J. TRASK (Caltech)

Nov. 1986

NPO-16658**Vol. 10, No. 6, P. 42**

Raster-scanned laser beam excites photocurrents in thin-film amorphous silicon devices. Solar-cell laser scanner uses two galvanometer-driven mirrors to scan laser-beam spot over surface of module or cell under test. Position signals from scan controllers used to index storage of photocurrent signal data in scan-converter image memory. Stored image displayed on television monitor.

B86-10490**FURNACE FOR TENSILE TESTING OF FLEXIBLE CERAMICS**

M. SMITH, C. A. ESTRELLA, and V. W. KATVALA

Nov. 1986

ARC-11589**Vol. 10, No. 6, P. 44**

Ceramic cloth and thread tested quickly at temperatures up to 1,250 degree C. Tensile strengths of ceramic cloths and threads measured conveniently in new furnace at specified temperatures up to 1,250 degree C, using ordinary mechanical tester. Samples heated along part of their lengths in furnace slots. Interchangeable furnace chambers and matching heating elements sized to match size of tested ceramic material.

B86-10491**STAR-VIEWING SCHEDULER**

O. T. GUFFIN, B. H. ROBERTS (Boeing Computer Support Service), and P. L. WILLIAMSON (Boeing Computer Support Service)

Nov. 1986

MFS-28089**Vol. 10, No. 6, P. 45**

Strategy and algorithm produce well-balanced timetable that accommodates many constraints. Strategy for scheduling star observations on Space Shuttle astronomy missions ensures best use of three future ultraviolet telescopes. Strategy, described in report, takes into account such diverse factors as maneuvers of Space Shuttle orbiter, interference by Moon, occultation by Earth, reflections, unstaffed periods during crew rotation, encounters with South Atlantic anomaly, and obscuration during dispersal of ejected water.

B86-10502**UPDATED THERMAL-RADIATION PROGRAM**

R. A. VOGT

Nov. 1986

MSC-20448/MS-21030**Vol. 10, No. 6, P. 60**

Thermal Radiation Analyzer System, TRASYS II, is computer-software system with generalized capability to solve radiation-related aspects of thermal-analysis problems. Used in conjunction with generalized thermal-analysis program, any thermal problem expressed in terms of lumped-parameter R-C thermal network solved.

B87-10009**LIQUID-CRYSTAL THERMAL-CONTROL PANELS**

R. F. DEHAYE, T. M. EDGE, and W. R. FELTNER

Jan. 1987

MFS-28036**Vol. 11, No. 1, P. 38**

Radiative temperature regulators have no moving parts. Conceptual temperature-regulating system proposed for spacecraft useful in automatic or remotely controlled regulation of solar heating in buildings, provided cost reduced sufficiently. System consists of liquid-crystal panels made to absorb or reflect sunlight.

B87-10010**INEXPENSIVE METER FOR TOTAL SOLAR RADIATION**

E. G. LAUE (Caltech)

Jan. 1987

NPO-16741**Vol. 11, No. 1, P. 38**

Pyranometer containing solar cells measures combined intensity of direct light from Sun and diffuse light from sky. Instrument includes polyethylene dome that diffuses entering light so output of light detectors does not vary significantly with changing angle of Sun during day. Not to be calibrated for response of each detector to Sun angle, and sensor outputs not corrected separately before summed and integrated. Aids in deciding on proper time to harvest crops.

B87-10011**MICROWAVE PROPERTIES OF QUIET SEAS**

J. M. STACEY (Caltech)

Jan. 1987 See Also N85-35322/NSP

NPO-16691**Vol. 11, No. 1, P. 39**

Microwave fluxes from three quiet seas documented for five microwave frequencies. Measurements taken by satellite in Earth orbit with mechanically scanned antenna. 10-channel receiver used to record simultaneously signal intensities in both horizontal and vertical polarizations at each frequency. Comparisons of flux measurements of three quiet seas drawn, and results discussed and analyzed.

B87-10020**PLANNING ORBITER FLIGHTS**

H. M. HARRIS (Caltech), M. J. BERGAM (Caltech), S. L. KIM (Caltech), and E. A. SMITH (Caltech)

Jan. 1987

NPO-16933**Vol. 11, No. 1, P. 44**

Shuttle Mission Design and Operations Software (SMDOS) assists in design and operation of missions involving spacecraft in low orbits around Earth by providing orbital and graphics information. SMDOS performs following five functions: display two world and two polar maps or any user-defined window 5 degrees high in latitude by 5 degrees wide in longitude in one of eight standard projections; designate Earth sites by points or polygon shapes; plot spacecraft ground track with 1-min demarcation lines; display, by means of different colors, availability of Tracking and Data Relay Satellite to Shuttle; and calculate available times and orbits to view particular site, and corresponding look angles. SMDOS written in Laboratory Micro-systems FORTH (1979 standard)

03 PHYSICAL SCIENCES

B87-10021 **PROGRAM FOR THERMOSPHERIC CALCULATIONS**

A. HEDIN

Jan. 1987

GSC-12989

Vol. 11, No. 1, P. 46

MSIS83 computer program for empirical model of thermosphere based on mass-spectrometer and incoherent-scattering data. Provides description of atmospheric temperature, density, and composition at altitudes higher than 85 kilometers. Co-efficients account for yearly and daily variations, and solar activity. Variations due to magnetic storms represented by 3-hour magnetic ap indices. MSIS83 model enables more timely prediction of aeronomic densities for such specific events as rocket flights. MSIS83 written in FORTRAN 77.

B87-10062 **VERSATILE X-RAY TELESCOPE**

R. B. HOOVER

Feb. 1987

MFS-28013

Vol. 11, No. 2, P. 32

Proposed telescope for x-rays and extreme ultraviolet rays features high spectral and spatial resolution. Basic x-ray telescope includes glancing-incidence, two-element primary reflector and concave, off-axis ellipsoidal secondary reflector. Different versions of telescope obtained by use of different reflector and detector configurations.

B87-10063 **DETERMINING OPTICAL AXES OF UNIAXIAL CRYSTALS**

H. J. SCHOCK, C. A. REGAN, and J. A. LOCK (Cleveland State University)

Feb. 1987 See Also N86-22915/NSP

LEW-14452

Vol. 11, No. 2, P. 35

Polarizing-microscope concept adapted for thick samples. Optical axis of crystal usually found by examining sample thinner than 1 mm between crossed polarizing plates. Frequently impractical to cut off small sample of crystal for testing, technique modified to accommodate large crystals. Ability to circumvent effect of birefringence has applications where laser beams must be transmitted through uniaxial crystals, as in laser diagnostics of contained flows in systems requiring windows for optical access.

B87-10064 **WIDE-ANGLE, FLAT-FIELD TELESCOPE**

K. L. HALLAM, B. J. HOWELL, and M. E. WILSON

Feb. 1987

GSC-12825

Vol. 11, No. 2, P. 36

All-reflective system unvignetted. Wide-angle telescope uses unobstructed reflecting elements to produce flat image. No refracting elements, no chromatic aberration, and telescope operates over spectral range from infrared to far ultraviolet. Telescope used with such image detectors as photographic film, vidicons, and solid-state image arrays.

B87-10065 **MORE EFFICIENT SOLAR THERMAL-ENERGY RECEIVER**

M. O. DUSTIN

Feb. 1987

LEW-14309

Vol. 11, No. 2, P. 37

Thermal stresses and reradiation reduced. Improved design for solar thermal-energy receiver overcomes three major deficiencies of solar dynamic receivers described in literature. Concentrator and receiver part of solar-thermal-energy system. Receiver divided into radiation section and storage section. Concentrated solar radiation falls on boiling ends of heat pipes, which transmit heat to thermal-energy-storage medium. Receiver used in number of applications to produce thermal energy directly for use or to store thermal energy for subsequent use in heat engine.

B87-10066 **CALIBRATION OF GERMANIUM RESISTANCE THERMOMETERS**

D. LADNER, E. URBAN, and F. C. MASON (Middle Tennessee University)

Feb. 1987

MFS-27107

Vol. 11, No. 2, P. 38

Largely completed thermometer-calibration cryostat and probe allows six germanium resistance thermometers to be calibrated at one time at superfluid-helium temperatures. In experiments involving several such thermometers, use of this calibration apparatus results in substantial cost savings. Cryostat maintains temperature less than 2.17 K through controlled evaporation and removal of liquid helium from Dewar. Probe holds thermometers to be calibrated and applies small amount of heat as needed to maintain precise temperature below 2.17 K.

B87-10114 **WATER-COOLED OPTICAL THERMOMETER**

A. A. MENNA (Mobil Solar Energy Corp.)

Mar. 1987

NPO-16492

Vol. 11, No. 3, P. 30

Water-cooled optical probe measures temperature of nearby radiating object. Intended primarily for use in silicon-growing furnace for measuring and controlling temperatures of silicon ribbon, meniscus, cartridge surfaces, heaters, or other parts. Cooling water and flushing gas cool fiber-optic probe and keep it clean. Fiber passes thermal radiation from observed surface to measuring instrument.

B87-10115 **FIELD-REVERSAL SOURCE FOR NEGATIVE HALOGEN IONS**

A. CHUTJIAN (Caltech), O. J. ORIENT (Caltech), and S. H. ALADZHADZHIAN (Caltech)

Mar. 1987

NPO-16247

Vol. 11, No. 3, P. 31

Large zero-energy electron-attachment cross sections result in intense ion beams. Concept for producing negative halogen ions takes advantage of large cross sections at zero kinetic energy for dissociative attachment of electrons to such halogen-containing gases as SF₆, CFCI₃, and CCl₄.

B87-10116 **MEASURING SHAPES OF ACOUSTICALLY LEVITATED DROPS**

E. H. TRINH (Caltech), and C. J. HSU (Caltech)

Mar. 1987

NPO-16746

Vol. 11, No. 3, P. 32

Instrument records shadows of drops in acoustic field. Shapes of acoustically levitated liquid drops and gas bubbles examined by shadow projector. Although acoustic radiation pressure counterbalances gravitational force acting on levitated drops and bubbles, pressure usually not uniform over surfaces and causes them to assume nonspherical shapes. Shape of drop or bubble gives useful information about acoustic field and levitated material. Held aloft in laser beam by acoustic field, liquid drop casts shadow on photographic film. Changing shape of drop recorded in sequence of exposures.

B87-10117 **CONTAINERLESS ATOMIC-FLUORESCENCE PROPERTY MEASUREMENTS**

P. NORDINE (Midwest Research Institute), R. SCHIFFMAN (Midwest Research Institute), and C. WALKER (Midwest Research Institute)

Mar. 1987 See Also N84-25481/NSP

MFS-27070

Vol. 11, No. 3, P. 32

Report describes studies conducted to establish and verify use

of laser-induced fluorescence in monitoring and controlling high-temperature containerless processes. Specimens levitated by gas jets or electromagnetic fields and heated by laser beams or electromagnetic induction while being irradiated and detected by fluorescence technique. Makes quantitative and qualitative comparisons among three new methods of temperature measurement; all rely on laser-induced fluorescence. One method gas-density thermometry with seed gas. Other two methods involve measurements of velocities of evaporating atoms or of population ratios of different electronic states.

B87-10118

PRODUCING HYDROGEN WITH SUNLIGHT

J. R. BIDDLE (Caltech), D. B. PETERSON (Caltech), and T. FUJITA (Caltech)

Mar. 1987 See Also N84-32917/NSP

NPO-16728

Vol. 11, No. 3, P. 33

Costs high but reduced by further research. Producing hydrogen fuel on large scale from water by solar energy practical if plant costs reduced, according to study. Sunlight attractive energy source because it is free and because photon energy converts directly to chemical energy when it breaks water molecules into diatomic hydrogen and oxygen. Conversion process low in efficiency and photochemical reactor must be spread over large area, requiring large investment in plant. Economic analysis pertains to generic photochemical processes. Does not delve into details of photochemical reactor design because detailed reactor designs do not exist at this early stage of development.

B87-10126

DESIGNING ECHELLE SPECTROGRAPHS

A. DANTZLER

Mar. 1987

GSC-13009

Vol. 11, No. 3, P. 40

Performance numbers and output maps computed from inputs supplied by user. Echelle Spectrograph Design Aid program (EGRAM) aids in design of spectrographic systems that utilize echelle/first-order crossdisperser combinations. Optical combination causes two-dimensional echellogram to fall on detector. Describes echellogram with enough detail to enable user to judge effectively feasibility of spectrograph design. By iteratively altering system parameters, desired echellogram achieved without making physical model. Calculates system parameters accurately to first order and compare favorably to results from raytracing techniques. EGRAM written in two versions. FORTRAN 77, and Microsoft BASIC A.

B87-10168

INCREASED ACCURACY IN ULTRASONIC MATERIAL CHARACTERIZATION

EDWARD R. GENERAZIO (Lewis Research Center)

Apr. 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEI: 703-487-4650) (N84-32849/NSP)

LEW-14288

Vol. 11, No. 4, P. 30

Improvements in ultrasonic measuring technology obtained. Used in variety of ways, to include: Determination of ultrasonic attenuation and velocity in heat-engine ceramics and advanced metals; verification of accuracy of ultrasonic measurements; and real-time in situ ultrasonic monitoring of microstructural changes. Technology interests producers and fabricators of metals and ceramics for aerospace and other critical applications.

B87-10169

FUEL-RICH CATALYTIC COMBUSTION

THEODORE A. BRABBS (Lewis Research Center), and SANDRA L. OLSON (Lewis Research Center)

Apr. 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEI: 703-487-4650) (N85-31244/NSP and

N85-28983/NSP)

LEW-14367

Vol. 11, No. 4, P. 31

Two-stage combustion system reduces particulate emissions. Program on catalytic oxidation of iso-octane demonstrates feasibility of two-stage combustion system for reducing particulate emissions. With fuel-rich (fuel/air equivalence ratios of 4.8 to 7.8) catalytic-combustion preburner as first stage, combustion process free of soot at reactor-outlet temperatures of 1,200 K or less.

B87-10170

SEPARATING PEAKS IN X-RAY SPECTRA

DAVID NICOLAS (Marshall Space Flight Center), CLAYBORNE TAYLOR (Marshall Space Flight Center), and THOMAS WADE (Marshall Space Flight Center)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26039

Vol. 11, No. 4, P. 31

Deconvolution algorithm assists in analysis of x-ray spectra from scanning electron microscopes, electron microprobe analyzers, x-ray fluorescence spectrometers, and like. New algorithm automatically deconvolves x-ray spectrum, identifies locations of spectral peaks, and selects chemical elements most likely producing peaks. Technique based on similarities between zero- and second-order terms of Taylor-series expansions of Gaussian distribution and of damped sinusoid. Principal advantage of algorithm: no requirement to adjust weighting factors or other parameters when analyzing general x-ray spectra.

B87-10171

PULSED ELECTRON GUN

SANTOSH K. SRIVASTAVA (Caltech), and MURTADHA A. KHAKOO (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16235

Vol. 11, No. 4, P. 32

Magnetically-collimated electron gun generates electron pulses with peak instantaneous currents of approximately microA with pulse widths of approximately 0.35 ns.

B87-10172

SOLAR THERMOELECTRIC CONVERTERS

M. KUDRET SELCUK (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16638

Vol. 11, No. 4, P. 33

Existing technologies combined to exploit solar power. Report discusses design concepts for alkali metal thermoelectric power converters heated by Sun. Several alternative configurations of equipment presented, with brief analyses of engineering problems and important features of each.

B87-10173

ULTRAVIOLET MEASUREMENTS OF THE SUN

W. HENZE (Teledyne Brown Engineering), and W. J. WAGNER

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-25909

Vol. 11, No. 4, P. 33

Wealth of experimentation with spaceborne spectroscopic and polarimetric instrument described. Instrument consists primarily of telescope, spectrometer, polarimeter, and associated electronics. Through ability of instrument possible to study evolution, in space and time, of spectral-line intensities, densities, and mass motions in preflare and flare-transition-zone plasmas-novel feature for spacecraft instrument.

B87-10219**IONIZATION CHAMBER MEASURES EXTREME ULTRAVIOLET**
ROBERT W. CARLSON (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16369**Vol. 11, No. 5, P. 30**

Ionization chamber operates in nearly total photon absorption as stable, self-calibrating detector of ionizing extreme ultraviolet radiation. Working gas of instrument is neon; photoionization properties well known and readily applicable to absolute measurements. Designed for measurements of solar ultraviolet flux aboard sounding rocket, instrument used on Earth to measure ultraviolet radiation in vacuum systems. Ionization chamber collects positive neon ions and electrons produced by irradiation of neon gas by ultraviolet photons. Approximately one ion produced by each photon; consequently, photoionization current nearly proportional to photon flux.

B87-10220**CORRELATION OF CATALYTIC RATES WITH SOLUBILITY PARAMETERS**

DANIEL D. LAWSON (Caltech), and CHRISTOPHER ENGLAND (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16613**Vol. 11, No. 5, P. 31**

Catalyst maximizes activity when its solubility parameter equals that of reactive species. Catalytic activities of some binary metal alloys at maximum when alloy compositions correspond to Hildebrand solubility parameters equal to those of reactive atomic species on catalyst. If this suggestive correlation proves to be general, applied to formulation of other mixed-metal catalysts. Also used to identify reactive species in certain catalytic reactions.

B87-10221**DETERMINING HEATS OF COMBUSTION OF GASEOUS HYDROCARBONS**

JAG J. SINGH, DANNY R. SPRINKLE, and RICHARD L. PUSTER
May 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-20753/NSP)

LAR-13528**Vol. 11, No. 5, P. 31**

Enrichment-oxygen flow rate-ratio related to heat of combustion. Technique developed for determining heats of combustion of natural-gas samples. Based on measuring ratio m/n , where m is (volumetric) flow rate of oxygen required to enrich carrier air in which test gas flowing at rate n is burned, such that mole fraction of oxygen in combustion-product gases equals that in carrier air. The m/n ratio directly related to heats of combustion of saturated hydrocarbons present in natural gas.

B87-10222**SCANNING SYSTEM FOR LASER VELOCIMETER**
WILLIAM D. GUNTER, and ANEMARIE DE YOUNG

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11547**Vol. 11, No. 5, P. 33**

Interference fringes remain parallel and focus-spot diameter same. Scanning system proposed for laser velocimeter (laser Doppler anemometer) to maintain constant beam-crossing angle and beam-waist diameter maintaining beam waist locations at crossing points. As target fluid scanned, interference fringes formed by crossing beams remain parallel and the focus-spot diameter same. System allows accurate velocity profiles obtained in wind tunnels and other fluid flow systems.

B87-10223**CCD LUMINESCENCE CAMERA**

JAMES R. JANESICK (Caltech), and TOM ELLIOTT (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16547**Vol. 11, No. 5, P. 34**

New diagnostic tool used to understand performance and failures of microelectronic devices. Microscope integrated to low-noise charge-coupled-device (CCD) camera to produce new instrument for analyzing performance and failures of microelectronics devices that emit infrared light during operation. CCD camera also used to identify very clearly parts that have failed where luminescence typically found.

B87-10270**REMOTE OPTICAL COMBUSTION ANALYZER**

A. C. ECKBRETH (United Technologies Research Center), and J. A. SHIRLEY (United Technologies Research Center)

Jun. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28146**Vol. 11, No. 6, P. 32**

Rugged optical head enables remote, nonintrusive measurements of temperatures and chemical compositions in hostile environments. Head brings laser light to system under test and carries system-scattered light to spectrograph or other instrument. Optical head beams light from laser source to test chamber, then collects backscattered light from chamber and sends it to spectrographic equipment. Lenses, prisms, and optical-fiber tips moved so that focal point precisely positioned in test chamber.

B87-10271**CASCADED-BLACKBODY HEAT RADIATORS**

MICHAEL D. KEDDY (Thermacore, Inc.), G. YALE EASTMAN (Thermacore, Inc.), and DONALD M. ERNST (Thermacore, Inc.)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26033**Vol. 11, No. 6, P. 33**

New class of heat radiators made of metal or other conductive fin stock, fins of which are textured or covered with smaller fins. Measured from outside, effective emissivity of projected radiator surface greater than, and somewhat independent of, emissivity of flat surface made of same material. Special coatings to enhance emissivity not required, and emissivity not degraded significantly in long term by environmental effects. Intended originally to radiate excess heat away from spacecraft, new radiators also used on Earth to dissipate heat in vacuum systems.

B87-10272**ESR ANALYSIS OF POLYMER PHOTO-OXIDATION**

SOON SAM KIM (Caltech), RANTY HING LIANG (Caltech), FUN-DOW TSAY (Caltech), and AMITAVE GUPTA (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16847**Vol. 11, No. 6, P. 34**

Electron-spin resonance identifies polymer-degradation reactions and their kinetics. New technique enables derivation of kinetic model of specific chemical reactions involved in degradation of particular polymer. Detailed information provided by new method enables prediction of aging characteristics long before manifestation of macroscopic mechanical properties.

B87-10273**ELECTRON-SPIN RESONANCE IN BORON CARBIDE**

CHARLES WOOD (Caltech), EUGENE L. VENTURINI (Caltech), LARRY J. AZEVEDO (Caltech), and DAVID EMIN (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16884

Vol. 11, No. 6, P. 34

Samples exhibit Curie-law behavior in temperature range of 2 to 100 K. Technical paper presents studies of electron-spin resonance of samples of hot pressed B9 C, B15 C2, B13 C2, and B4 C. Boron carbide ceramics are refractory solids with high melting temperatures, low thermal conductivities, and extreme hardnesses. They show promise as semiconductors at high temperatures and have unusually large figures of merit for use in thermoelectric generators.

B87-10319

GLASS-TO-METAL SEAL AGAINST LIQUID HELIUM

JOHN L. WATKINS (Caltech), and JOHN R. GATEWOOD (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16308

Vol. 11, No. 7, P. 43

Simple compression joint with indium gasket forms demountable seal for superfluids. Seal developed for metal lid on glass jar used in experiments on liquid helium. Glass container allows contents to be viewed for such purposes as calibration of liquid-level detectors and adjustments of displacement plungers. Seal contains liquid helium even when temperature drops below 2.19K. Made from inexpensive, commercially available materials and parts.

B87-10320

APPROXIMATE ANALYSIS OF SEMICONDUCTOR LASER ARRAYS

WILLIAM K. MARSHALL (Caltech), and JOSEPH KATZ (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16813

Vol. 11, No. 7, P. 44

Simplified equation yields useful information on gains and output patterns. Theoretical method based on approximate waveguide equation enables prediction of lateral modes of gain-guided planar array of parallel semiconductor lasers. Equation for entire array solved directly using piecewise approximation of index of refraction by simple functions without customary approximation based on coupled waveguide modes of individual lasers. Improved results yield better understanding of laser-array modes and help in development of well-behaved high-power semiconductor laser arrays.

B87-10321

APODIZATION CONTROL OF LINE SHAPE IN SPECTROMETER

ANTONIO PIRES (Perkin Elmer Corp.), EDWARD NIPLE (Perkin Elmer Corp.), and NATHAN L. EVANS (Perkin Elmer Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16389

Vol. 11, No. 7, P. 45

Kaiser-Bessel apodization function reduces unwanted sidebands. Report discusses apodization in Fourier-transform spectrometer (FTS) for Advanced Moisture and Temperature Sounder (AMTS). Purpose of apodization in instrument to control shape of spectrum in wavenumber space to keep radiation at other wavelengths in passband of spectrometer out of AMTS wavenumber channel.

B87-10322

OVERVIEW OF FIBER-OPTICAL SENSORS

RAMON P. DEPAULA (Caltech), and EMERY L. MOORE (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16817

Vol. 11, No. 7, P. 45

Design, development, and sensitivity of sensors using fiber optics reviewed. State-of-the-art and probable future developments of sensors using fiber optics described in report including references to work in field. Serves to update previously published surveys. Systems incorporating fiber-optic sensors used in medical diagnosis, navigation, robotics, sonar, power industry, and industrial controls.

B87-10339

PROGRAM FOR PARABOLOIDAL SOLAR CONCENTRATORS

LIANG-CHI WEN (Caltech), and PHILIP O'BRIEN (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16870

Vol. 11, No. 7, P. 62

Solar-Concentrator Code for Paraboloidal Dishes (SOLCOL) aids in design and analysis of solar collectors in space station. Calculates quality of solar image and flux distribution on specified target surface. Receiver target is focal plane cylinder, hemisphere, or any arbitrary surface, normals to which supplied. Used to assess optical performance of concentrator. Written in FORTRAN 77.

B87-10387

COMA-COMPENSATED TELESCOPE WITH VERTEX CHOPPING

MALCOLM J. MACFARLANE (Perkin-Elmer Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11628

Vol. 11, No. 8, P. 39

New design for chopped-infrared astronomical telescope reduces coma to increase image quality. Coma introduced by tilting cancelled by shaping of secondary mirror to introduce equal but opposite amount of coma independent of tilt angle. Because of this measure, telescope performance on axis remains limited mainly by diffraction.

B87-10388

ENCAPSULATING X-RAY DETECTORS

JOSEPH M. CONLEY (Caltech), and JAMES G. BRADLEY (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16910

Vol. 11, No. 8, P. 40

Vapor-deposited polymer shields crystals from environment while allowing X rays to pass. Polymer coating transparent to X rays applied to mercuric iodide detector in partial vacuum. Coating protects crystal from sublimation, chemical attack, and electrical degradation.

B87-10389

MEASURING MICROWAVE EMISSIVITIES

HANS-JUERGEN C. BLUME

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13455

Vol. 11, No. 8, P. 40

Dicke radiometer and cryoload combined in emissivity determinations of mesh antennas. Newly developed measuring apparatus and procedure fills technological void in accurate determination of surface emissivities at microwave frequencies.

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Capable of measuring independently electromagnetic emissivity and/or intrinsic losses of surfaces, comprises radiometer, horn antenna, test section, and cryogenically cooled matched load.

B87-10390

COMPENSATING FOR ELECTRO-OSMOSIS IN ELECTROPHORESIS

PERCY H. RHODES, and ROBERT S. SNYDER

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28142 Vol. 11, No. 8, P. 41

Simple mechanical adjustment eliminates transverse velocity component. New apparatus for moving-wall electrophoresis increases degree of collimation of chemical species in sample stream. Electrophoresis chamber set at slight angle in horizontal plane to adjust angle between solution flow and wall motion. Component of velocity created cancels electro-osmotic effect.

B87-10391

MEASURING SPECIFIC HEATS AT HIGH TEMPERATURES

JAN W. VANDERSANDE (Caltech), ANDREW ZOLTAN (Caltech), and CHARLES WOOD (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16765 Vol. 11, No. 8, P. 42

Flash apparatus for measuring thermal diffusivities at temperatures from 300 to 1,000 degrees C modified; measures specific heats of samples to accuracy of 4 to 5 percent. Specific heat and thermal diffusivity of sample measured. Xenon flash emits pulse of radiation, absorbed by sputtered graphite coating on sample. Sample temperature measured with thermocouple, and temperature rise due to pulse measured by InSb detector.

B87-10392

TESTING INSTRUMENT FOR FLIGHT-SIMULATOR DISPLAYS

RICHARD F. HAINES

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11504 Vol. 11, No. 8, P. 42

Displays for flight-training simulators rapidly aligned with aid of integrated optical instrument. Calibrations and tests such as aligning boresight of display with respect to user's eyes, checking and adjusting display horizon, checking image sharpness, measuring illuminance of displayed scenes, and measuring distance of optical focus of scene performed with single unit. New instrument combines all measurement devices in single, compact, integrated unit. Requires just one initial setup. Employs laser and produces narrow, collimated beam for greater measurement accuracy. Uses only one moving part, double right prism, to position laser beam.

B87-10393

ANALYZING NONISOTHERMAL CRYSTALLIZATION OF THERMOPLASTICS

PEGGY CEBE (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16866 Vol. 11, No. 8, P. 43

Method developed for analysis of nonisothermal cold crystallization in thermoplastics. Does not require prior knowledge of isothermal kinetic parameters. Based upon observation: During nonisothermal crystallization at constant rate, relative crystallinity develops with time dependence sigmoidal at low degrees of conversion. Application for method is study of cold crystallization in advanced thermoplastics.

B87-10455

DUAL-MODE LASER VELOCIMETER

WILLIAM D. GUNTER, JR., RALPH W. DONALDSON, and ALMA G. ANDERSON, JR.

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11634 Vol. 11, No. 9, P. 50

Reversible lens system provides two velocity ranges. Laser velocimeter modified to provide two velocity ranges by adding rotatable assembly containing two lenses. In one orientation, beam waists narrow, and two beams intersect at relatively large angle, providing low velocity range with high spatial resolution. In reversed orientation beam waists are wider, and beams intersect at smaller angle to produce more-widely-spaced fringes in larger region, providing high velocity range with lower spatial resolution.

B87-10456

CONCENTRATING TRACE GASES AT LOW PRESSURES

JAMES F. VEDDER, DEAN O'HARA (San Jose State University Foundation), and TUYEN VO (San Jose State University)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11671 Vol. 11, No. 9, P. 52

Open adsorption tube enables measurement of gases at parts-per-trillion-by-volume concentrations. Traps trace materials in flowing gas. Variety of configurations possible; tube consists of single long coil instead of several short ones, and tube is made of materials other than stainless steel. Partial immersion of coil in cryogen results in 100 percent trapping rather than typical 85 percent for total immersion.

B87-10457

APPROXIMATE SIMULATION OF TURBULENCE

C. W. CAMPBELL (American Institute of Aeronautics and Astronautics)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28172 Vol. 11, No. 9, P. 53

Computed spectra resemble von Karman spectra of frequencies of interest. Numerical technique yields simulated atmospheric-turbulence spectra that closely approximates von Karman spectra within frequency ranges of interest for aircraft response. Suitable for computation in that they represent stable systems and roll off as f^{-2} at high frequencies outside range of interest.

B87-10458

MEASURING GASES WITH LASER-INDUCED FLUORESCENCE

ROBERT L. MCKENZIE, KENNETH P. GROSS (Polyatomic Research Institute), and PAMELA LOGAN (Stanford University)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11678 Vol. 11, No. 9, P. 53

Temperature, density, and pressure at selected point in low-temperature, turbulent gaseous flow measured simultaneously by pulsed laser-induced fluorescence (LIF). Measurements made with spatial and temporal resolution. LIF measurements nonintrusive and constitute first alternative means of measuring turbulent fluctuations in temperature and density that compares with conventional hot-wire-anemometer data. Laser beams focused to small spots in wind tunnel and reference cell induce fluorescence in nitric oxide, small amount mixed with main gas flow. Fluorescence radiation depends on main-gas temperature, pressure, and density and measured to deduce these quantities.

B87-10459**MEASURING ELECTROSTATIC DISCHARGE**

WILLIAM C. SMITH (Lockheed Engineering and Management Services Co., Inc.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21094**Vol. 11, No. 9, P. 54**

Apparatus measures electrostatic-discharge properties of several materials at once. Allows samples charged either by friction or by exposure to corona. By testing several samples simultaneously, apparatus eliminates errors introduced by variations among test conditions. Samples spaced so they pass at intervals under either of two retractable arms. Samples are 2 inches wide along circular path. Arm tips and voltmeter probe are 6 inches from turntable center. Servocontrolled turntable speed constant within 0.1 percent.

B87-10460**COATING A HYDROGEN-MASER CHAMBER WITH CF₄**

ROBERT F. C. VESSOT (Smithsonian Institution), and EDWARD MATTISON (Smithsonian Institution)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16380 NPO-16381**Vol. 11, No. 9, P. 55**

Coating of carbon tetrafluoride formed on interior surface of atomic-hydrogen maser by allowing gas to freeze on surface. New coating enables maser to oscillate down to 26 K; most effective previous coating, fluorinated ethylene/polypropylene (FEP) copolymer allowed oscillation down to about 50 K.

B87-10461**MEASURING CONTACT THERMAL CONDUCTANCES AT LOW TEMPERATURES**

LOUIS J. SALERNO, PETER KITTEL, WALTER BROOKS, ALAN L. SPIVAK (Trans-Bay Electronics, Inc.), and WILLIAM G. MARKS, JR. (Lockheed Missiles and Space Co.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11693**Vol. 11, No. 9, P. 56**

Instrument measures thermal conductance of pressed contacts in liquid helium. Makes measurements automatically as function of force on pairs of brass samples having various surface finishes. Developed as part of effort to determine heat-transfer characteristics of bolted joints on cryogenically cooled focal planes in infrared equipment. Cylindrical chamber hangs from cover plate in bath of liquid helium. Inside chamber rocker arm applies controlled force to samples. Upper sample made slightly wider than lower one so two samples remain in complete contact even under slight lateral misalignment.

B87-10462**HIGH-RYDBERG XENON SUBMILLIMETER-WAVE DETECTOR**

ARA CHUTJIAN (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16372**Vol. 11, No. 9, P. 57**

Proposed detector for infrared and submillimeter-wavelength radiation uses excited xenon atoms as Rydberg sensors instead of customary beams of sodium, potassium, or cesium. Chemically inert xenon easily stored in pressurized containers, whereas beams of dangerously reactive alkali metals must be generated in cumbersome, unreliable ovens. Xenon-based detector potential for infrared astronomy and for Earth-orbiter detection of terrestrial radiation sources. Xenon atoms excited to high energy states in two stages. Doubly excited atoms sensitive to photons in

submillimeter wavelength range, further excited by these photons, then ionized and counted.

B87-10526**NUMERICAL SIMULATION OF SILICON-RIBBON GROWTH**

BEN K. WODA (Caltech), CHIN-PO KUO (Caltech), SENOL UTKU (Caltech), and SUJIT KUMAR RAY (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16805**Vol. 11, No. 10, P. 50**

Mathematical model includes nonlinear effects. In development simulates growth of silicon ribbon from melt. Takes account of entire temperature and stress history of ribbon. Numerical simulations performed with new model helps in search for temperature distribution, pulling speed, and other conditions favoring growth of wide, flat, relatively defect-free silicon ribbons for solar photovoltaic cells at economically attractive, high production rates. Also applicable to materials other than silicon.

B87-10527**CONVECTIVE EVAPORATION OF SPRAYED LIQUID**

JOSETTE BELLAN (Caltech), and KENNETH G. HARSTAD (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16955**Vol. 11, No. 10, P. 50**

Theoretical model developed to analyze behavior of both dense and dilute clusters of evaporating liquid drops in gas flows. Particularly useful in search for methods of controlling evaporation, ignition, and combustion of fuel sprays.

B87-10528**PREDICTING VISIBLE RANGE OF AN OBJECT**

JOSEPH C. KING

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13078**Vol. 11, No. 10, P. 52**

Report and supplementary materials present method for estimating maximum distance which Spartan free flyer seen by star trackers on Space Shuttle. Brightness, and visible range calculated by using simplified model of object as reflector, taking into consideration orientation of object and predicted relative positions of Shuttle and Sun.

B87-10529**TESTING LONG-TERM EXPOSURE TO VACUUM**

D. L. CLARK (Martin Marietta Corp.), CHARLES E. FORSYTH (Martin Marietta Corp.), THOMAS L. RERUCHA (Martin Marietta Corp.), and WILLIAM J. ARBEGAST, JR. (Martin Marietta Corp.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16944**Vol. 11, No. 10, P. 53**

Facility for studying long-term effects of vacuum on materials described in report. Vacuum storage system maintains specimens at constant temperature and high vacuum. Enables specimens to be removed easily and safely for analysis. Nitrogen storage system maintains specimens at 77 degree F in pure, dry nitrogen gas under gauge pressure of 2 to 4 psi. Enables comparison of control specimens with specimens exposed to vacuum. Instrumentation-and-control system measures and records operating parameters and generates control signals and alarm indications as necessary.

B87-10538**IMPROVED GENERAL CHEMICAL-KINETICS PROGRAM**

DAVID A. BITTKER, and VINCENT J. SCULLIN

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14216**Vol. 11, No. 10, P. 58**

New general chemical-kinetics code, GCKP84, developed to compute progress of many types of complex gas-phase chemical reactions. Replaces original GCKP code and offers greatly improved efficiency, additional capabilities, and greater convenience. New code written in FORTRAN IV.

B87-10539**CALCULATING THERMODYNAMIC AND TRANSPORT PROPERTIES OF FLUIDS**

MARGARET P. PROCTOR, and MARK D. KLEM (U.S. Air Force)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14418**Vol. 11, No. 10, P. 60**

Computer program incorporates van der Waals equation and correction tables. FLUID program developed to calculate thermodynamic and transport properties of pure fluids in both liquid and gas phases. Properties calculated by use of simple gas model, empirical corrections, and efficient numerical interpolation scheme. Produces results that agree very well with measured values. Much faster than older, more complex programs developed for same purpose.

B87-10540**STAR-TRACKER COMPUTER PROGRAM**

THOMAS GLAVICH (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16862**Vol. 11, No. 10, P. 60**

Image-analyzing pointing systems aimed to high precision. Star-tracker program, STRACKER, developed to solve algorithm-design problems for area-array tracking and pointing systems operating at accuracies of 0.001 to 0.01 picture element. Includes auxiliary programs for reformatting point-spread data from commercial ACCOSV lens-design program. Other optical-analysis program data reformatted by use of utility routines included in package. Written in FORTRAN 77.

B88-10026**MODULATED-VOLTAGE METASTABLE-IONIZATION DETECTOR**

GLENN C. CARLE, DANIEL R. KOJIRO, and DONALD E. HUMPHRY

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11503**Vol. 12, No. 1, P. 58**

New detector retains sensitivity of conventional ones but automatically reduces voltage to prevent current saturation at higher values, enabling quantitative determination of relative concentrations approaching 100 percent. Detector includes feedback circuitry to prevent current saturation. When detector current begins to exceed threshold, detector high voltage reduced to keep current from rising much more. Recorder output shows detector-current and voltage-reduction signals from gas mixture with constituents both above and below threshold concentration. Those above threshold cause both current and voltage-reduction peaks. Those below threshold give rise to current peaks only.

B88-10027**LOCATING RESIDUAL WAX IN COOLANT CHANNELS**

DOUGLAS M. GUTHRIE (Rockwell International Corp.)

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29212**Vol. 12, No. 1, P. 59**

Neutron inspection finds deposits and defects invisible to x rays. Neutron radiography detects many low-density materials even when surrounded by larger quantities of denser materials. Materials with similar properties and densities often appear quite different when viewed by neutron radiography. Technique gives comprehensive view of hidden channels.

B88-10038**PROGRAM READS WEATHER-DATA TAPES FROM AIRCRAFT**

MIKE CARLTON (University of California), and CARL A. FRIEHE (University of California)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16744**Vol. 12, No. 1, P. 68**

Computer program developed to help read and analyze data gathered by airborne instruments for atmospheric research. By employing remote-sensing techniques, measurements of wind and wind stress obtained from airborne instruments in various locations and weather conditions. Written in FORTRAN 77.

B88-10039**ESTIMATING GEOPHYSICAL PARAMETERS FROM GRAVITY DATA**

WILLIAM L. SJOGREN (Caltech), and RAVENEL N. WIMBERLY (Sterling Software)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16671**Vol. 12, No. 1, P. 73**

ORBSIM program developed for accurate extraction of parameters of geophysical models from Doppler-radio-tracking data acquired from orbiting planetary spacecraft. Model of proposed planetary structure used in numerical integration along simulated trajectories of spacecraft around primary body. Written in FORTRAN 77.

B88-10087**SECTIONING COATED SPECIMENS WITHOUT EDGE ROUNDING**

TIMOTHY N. MCKECHNIE (Rockwell International Corp.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29228**Vol. 12, No. 2, P. 36**

New method devised for preparation of cross sections of coated specimens for scanning electron microscopy or energy-dispersive analysis without rounding edges of coatings. After cutting and polishing, specimen section remains smooth and flat so it can be examined under high magnification out to edge of coating. Sectioned blade first electroplated with hard nickel 0.003 in., then encapsulated in two layers of material: soft conductive material at bottom and 0.25 in. of hard diallyl phthalate at top. Nickel plate provides electrical path from surface of section to conductive material below.

B88-10088**COMPUTER-AIDED GONIOPHOTOMETER**

RICHARD G. HOLT

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12991**Vol. 12, No. 2, P. 38**

Repetitive measurements made more rapidly, with greater accuracy. Computer-compatible scanning goniophotometer enables semiautomatic measurement of angular uniformity of integrating hemisphere or other large-aperture light source. Scanning mechanism eliminates need to locate photometer manually at each viewing angle. Keeps photometer pointed at center of aperture while moving it to different viewing positions. Scanning motion of x-y plotter forms raster in vertical plane. Viewing angles visualized by simply drawing line from desired point on raster to center of aperture.

B88-10089**OPTICAL ALIGNMENT DEVICE FOR LASER COMMUNICATION**

WILLIAM L. CASEY (McDonnell-Douglas Corp.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16774**Vol. 12, No. 2, P. 40**

Optical alignment device under development enables continuous tracking and coalignment of two beams of light. Intended primarily for laser-communication station, in which transmitted beam must be aligned with received beam to ensure transmitted beam falls on receiver at other station. Expected to consume less power and be smaller and less complicated than alignment shutter and drive previously used. Prism and filter separate two overlapping collimated light beams of different wavelength or polarization. Coordinates of two beams tracked on charge-coupled device to determine degree of directional misalignment between two beams.

B88-10090**CALIBRATION OF OXYGEN MONITORS**

M. A. ZALENSKI (Wyle Laboratories), E. L. ROWE (Wyle Laboratories), and J. R. MCPHEE (Wyle Laboratories)

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-17359/NSP)

LAR-13619**Vol. 12, No. 2, P. 40**

Readings corrected for temperature, pressure, and humidity of air. Program for handheld computer developed to ensure accuracy of oxygen monitors in National Transonic Facility, where liquid nitrogen stored. Calibration values, determined daily, based on entries of data on barometric pressure, temperature, and relative humidity. Output provided directly in millivolts.

B88-10091**IMAGING OF DIRECTIONAL-SOLIDIFICATION INTERFACES**

ARCHIBALD L. FRIPP, JR., WILLIAM J. DEBNAM, JR., ROBERT F. BERRY, ROGER K. CROUCH (NASA Headquarters), PATRICK G. BARBER (Longwood College), and RICHARD SIMCHICK (PRC Kentron, Inc.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13597**Vol. 12, No. 2, P. 42**

X-ray and gamma-ray technique developed at NASA Langley Research Center enables melt/solid interface to be observed visually during crystal growth by directional solidification in Bridgman furnace. Technique used to observe movement and shape of interface in germanium and in lead tin telluride. Valuable tool in efforts to grow seeded semiconductor materials in Bridgman furnaces.

B88-10092**LOSS-COMPENSATED OPTICAL SENSOR SYSTEMS**

GLENN BEHEIM, and DONALD J. ANTHAN (Cleveland State University)

Feb. 1988 Additional information available through: NTIS,

Springfield, VA 22161 (Tel: 703-487-4650) (N87-13637/NSP)

LEW-14547**Vol. 12, No. 2, P. 44**

Variations in fiber losses little effect on outputs. Fiber-optic sensing system conceptually related to electrical bridge circuit scarcely affected by variations in losses of optical fibers and connectors. Versions of system investigated for use as linear- and angular-position sensors for advanced aircraft controls. Position accuracies of 8 to 10 bits eventually achieved.

B88-10093**HIGH-RESOLUTION DETECTOR FOR X-RAY DIFFRACTION**

DANIEL C. CARTER, WILLIAM K. WITHROW, MARC L. PUSEY, and VAUGHN H. YOST

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28232**Vol. 12, No. 2, P. 46**

Proposed x-ray-sensitive imaging detector offers superior spatial resolution, counting-rate capacity, and dynamic range. Instrument based on laser-stimulated luminescence and reusable x-ray-sensitive film. Detector scans x-ray film line by line. Extracts latent image in film and simultaneously erases film for reuse. Used primarily for protein crystallography. Principle adapted to imaging detectors for electron microscopy and fluorescence spectroscopy and general use in astronomy, engineering, and medicine.

B88-10094**LASER ANEMOMETER FOR TURBINE RESEARCH**

RICHARD G. SEASHOLTZ, and LOUIS J. GOLDMAN

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-24967/NSP)

LEW-14513**Vol. 12, No. 2, P. 46**

Three velocity components measured through one port. Laser anemometer combines conventional interference-fringe anemometer configuration with Fabry-Perot interferometer to enable simultaneous measurement of radial and transverse velocities. Transverse-velocity axis rotated, enabling measurement of both transverse-velocity components. Does not require large optical-access port for measurement of radial velocity.

B88-10095**LASER DOPPLER VELOCIMETER SYSTEM**

H. LEE SEEGMILLER, JON B. BADER, JOHN P. COONEY, ANEMARIE DE YOUNG, RALPH W. DONALDSON, JR., WILLIAM D. GUNTER, JR., and DEAN R. HARRISON

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11679**Vol. 12, No. 2, P. 47**

Seeded flows measured optically. Laser Doppler velocimeter integrated with wind-tunnel pressure vessel with mounting system minimizing effects of vibrations and of pressure and thermal strains.

B88-10096**COMPOUND WALLS FOR VACUUM CHAMBERS**

ROBERT E. FRAZER (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17039**Vol. 12, No. 2, P. 48**

Proposed compound-wall configuration enables construction of large high-vacuum chambers without having to use thick layers of expensive material to obtain necessary strength. Walls enclose chambers more than 1 m in diameter and several kilometers long. Compound wall made of strong outer layer of structural-steel culvert pipe welded to thin layer of high-quality, low-outgassing stainless steel.

03 PHYSICAL SCIENCES

B88-10097

ULTRAVIOLET LIDAR WOULD MEASURE WIND VELOCITY

IAIN STUART MCDERMID (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), JAMES B. LAUDENSLAGER (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and DAVID REES (University College London)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16756

Vol. 12, No. 2, P. 51

Incoherent Doppler-shifted scattering from aerosols reveals important weather data. Remote-sensing system in early stage of development makes global measurements of wind velocities along probing beam of ultraviolet light. In aviation system promotes safety through detection of wind shears and clear-air turbulence. System includes range-gated ultraviolet-excimer laser operating at 308 or 353 nm.

B88-10098

COMPUTATIONAL FLUID DYNAMICS: PAST, PRESENT, AND FUTURE

PAUL KUTLER

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-28057/NSP)

ARC-11738

Vol. 12, No. 2, P. 52

Paper reviews development of computational fluid dynamics and explores future prospects of technology. Report covers such topics as computer technology, turbulence, development of solution methodology, development of algorithms, definition of flow geometries, generation of computational grids, and pre- and post-data processing.

B88-10099

TECHNOLOGY DEVELOPED IN TWO SPACE PROJECTS

CARLTON H. JOSEPH (Optimum Services and Systems, Inc.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27185

Vol. 12, No. 2, P. 53

Two projects examined for their influences on commercial products and future space missions. Three-volume report presents study of technological benefits of two spaceflight projects, Galileo, and Hubble space telescope. Study focused on equipment and computer programs developed between initial approval of projects and integration and testing of the systems. Volume 1 presents overview of study, discusses methods of collection and evaluation of data, and offers conclusion and recommendations. Volume 2 describes interview process and summarizes raw data. Volume 3 contains technology-assessment sheets for developments.

B88-10170

FAST MEASUREMENTS OF THERMAL DIFFUSIVITIES OF CERAMICS

MARNELL SMITH, and HOWARD E. GOLDSTEIN

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11705

Vol. 12, No. 3, P. 37

Temperature rises of samples compared with reference sample. Apparatus quickly measures thermal diffusivities of ceramics at high temperatures. Produces data on relative thermal diffusivities of as many as six ceramic specimens per hour. Thermal-diffusivity tester makes it easy to determine thermal diffusivities of ceramics. Pronounced effects of processing parameters on thermal properties of ceramics evaluated quickly.

B88-10171

WET-ATMOSPHERE GENERATOR

RICHARD M. HAMMER (Teledyne Brown Engineering Corp.), and JANICE K. MCGUIRE (Teledyne Brown Engineering Corp.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28177

Vol. 12, No. 3, P. 38

Water content in gas controlled. Portable flow-control system generates nitrogen/water atmosphere having range of dew points and pressures. One use of system provides wet nitrogen for canister of wide-field camera requiring this special atmosphere. Also used to inject trace gases other than water vapor for leak testing of large vessels. Potential applications in photography, hospitals, and calibration laboratories.

B88-10172

PROBING POLYMER-SEGMENT MOTIONS BY ESR

FUN-DOW TSAY (Caltech), and AMITAVA GUPTA (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16970

Vol. 12, No. 3, P. 39

Molecular origins of mechanical properties and aging processes studied. Rotational motions of segments of poly(methyl methacrylate) molecules studied theoretically and experimentally. Activation energies of these motions as determined from temperature dependencies of ESR spectra agree closely with predictions of theory.

B88-10173

MEASURING INCORPORATION OF ARSENIC IN MOLECULAR-BEAM EPITAXY

BLAIR F. LEWIS (Caltech), ROUEL F. FERNANDEZ (Caltech), ANUPAM MADHUKAR (Caltech), and FRANK J. GRUNTHANER (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16821

Vol. 12, No. 3, P. 39

Changes in surface layers cause oscillations in RHEED measurements. Specular RHEED Beam intensity measured before, during, and after deposition of seven to eight monomolecular layers of gallium during 1.5 seconds. Arsenic pressure was 1.7×10^{-10} to the negative seventh power torr (2.3×10^{-10} to the negative fifth power Pa) throughout measurements.

B88-10174

CALCULATING ATMOSPHERIC EFFECTS IN SATELLITE IMAGERY: PART 2

DAVID J. DINER (Caltech), and JOHN V. MARTONCHIK (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16371

Vol. 12, No. 3, P. 40

Practical computational techniques developed. Report discusses practical considerations of calculation of three-dimensional radiative transfer. Extension of earlier theoretical developments described in 'Calculating Atmospheric Effects in Satellite Imagery' NPO-16373.

B88-10219

MULTIPLE-DIODE-LASER GAS-DETECTION SPECTROMETER

CHRISTOPHER R. WEBSTER (Caltech), REINHARD BEER (Caltech), and STANLEY P. SANDER (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17095

Vol. 12, No. 4, P. 32

Small concentrations of selected gases measured automatically. Proposed multiple-laser-diode spectrometer part of system for measuring automatically concentrations of selected gases at part-per-billion level. Array of laser/photodetector pairs measure infrared absorption spectrum of atmosphere along probing laser beams. Adaptable to terrestrial uses as monitoring pollution or control of industrial processes.

B88-10220**MULTITEMPERATURE CRYOGENIC RADIATIVE COOLER**

STEVEN BARD (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16957**Vol. 12, No. 4, P. 32**

Multiple radiator stages separated by V-groove shields protect main cooler from parasitic heat radiation and offer usable cooling themselves. Proposed cryogenic radiative cooler achieves lower temperatures previously possible with passive radiators in space. Provides useful cooling power at several temperatures instead of one. Cold-radiator stage protected by multiple shield assemblies intercepting radiation heat leaks from warmer supporting structure and redirects it out to space. Each shield assembly has effective cooling capacity enabling it to cool optical filter.

B88-10221**OPTICAL DETECTION OF CRYOGENIC LEAKS**

LYNN M. WYETT (Rockwell International Corp.)

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29278**Vol. 12, No. 4, P. 33**

Conceptual system identifies leakage without requiring shutdown for testing. Proposed device detects and indicates leaks of cryogenic liquids automatically. Detector makes it unnecessary to shut equipment down so it can be checked for leakage by soap-bubble or helium-detection methods. Not necessary to mix special gases or other materials with cryogenic liquid flowing through equipment.

B88-10222**ANTIREFLECTION OVERCOAT FOR SUBMILLIMETER WAVELENGTHS**

SHELDON M. SMITH

Apr. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-28730)

ARC-11718**Vol. 12, No. 4, P. 34**

Coating thickness not critical. Polytetrafluoroethylene antireflection overcoat reduces specular reflectance of opaque baffle coating by factor of nearly 2 at millimeter and infrared wavelengths. Easily applied by spraying Teflon(TM) Wet Lubricant (or equivalent) on opaque coated surface. Though technique makes it difficult to control thickness of overcoat, experimental and theoretical studies indicate thickness has little effect because antireflective property based on creating graded-index absorber.

B88-10223**STANDARDS FOR BIDIRECTIONAL REFLECTANCE AND TRANSMITTANCE**

WILLIAM K. WITHEROW

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28183**Vol. 12, No. 4, P. 37**

Sample-to-sample variations reduced. Improved reference or standard samples for measurement of bidirectional reflectance or transmittance distribution functions made by depositing single layers of spheres of same size on flat surfaces. New reference samples

replicated easily and consistently, durable with moderate care. Used to reconcile different measurement facilities.

B88-10224**ELECTRON-PHOTON COINCIDENCE CALIBRATION OF PHOTON DETECTORS**

SANTOSH K. SRIVASTAVA (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15644**Vol. 12, No. 4, P. 37**

Absolute and relative detector efficiencies measured. Apparatus uses coincidence-counting techniques to measure efficiency of ultraviolet or vacuum ultraviolet detector at very low radiation intensity. Crossed electron and atomic beams generate photons used to calibrate photon detector. Pulses from electron counter and photon detector(s) processed by standard coincidence-counting techniques. Used to calibrate other detectors or make absolute measurements of incident photon fluxes.

B88-10225**MONITORING THE ATMOSPHERE BY DIODE-LASER SPECTROSCOPY**

MAX LOEWENSTEIN, and JAMES PODOLSKIE

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11775**Vol. 12, No. 4, P. 38**

Report describes state of art of tunable-diode-laser second-harmonic spectroscopy applied to measurements of concentrations of trace constituents of atmosphere. Combination of temperature, composition, and drive-current tuning, wavelengths of tunable diode lasers varied over infrared range of 3 to 30 micrometer, containing spectral lines of many molecules of interest in atmospheric research.

B88-10226**EFFECTIVE-MASS THEORY FOR INHOMOGENEOUS SEMICONDUCTORS**

OLDWIG VON ROOS (Caltech), DANIEL SCHECHTER (California State University), and HARRY MAVROUMATIS (American University)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16807**Vol. 12, No. 4, P. 39**

Five papers present derivations in effective-mass theory for semiconducting materials of gradually varying spatial composition. In paper entitled 'Position-Dependent Effective Masses in Semiconductor Theory,' concept of spatially-varying effective masses reviewed and shown unworkable. Second paper considers compound semiconductor having gradual spatial variation of composition. Third paper shows effective masses depend on average of chemical composition over entire crystal. Pair of papers entitled 'Forces Acting on Free Carriers in Semiconductors of Inhomogeneous Composition' show it is incorrect to apply extended Wannier-Slater theorem using spatially changing effective masses, and quasi-electric fields due to spatial variations in chemical composition do not depend explicitly on temperature.

B88-10227**STUDY OF LARGE TELESCOPES**

DIETRICH KORSCH (Korsch Optics, Inc.)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27143**Vol. 12, No. 4, P. 39**

Document considers selection of suitable telescope for advanced space laboratory. Analyzes and compares two- and

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four-mirror telescopes, both practical and structurally similar. Emphasizes analysis of four-mirror telescope systems, since design and performance characteristics of two-mirror telescopes well known. Three-mirror systems not considered.

B88-10228

FORMULA FOR EVALUATION OF NICKEL/HYDROGEN CELLS HAROLD F. LEIBECKI

Apr. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-31680)

LEW-14537

Vol. 12, No. 4, P. 40

Displays complete discharge curves showing changes in behavior of each cell during life and difference among cells. Equation developed to give quantitative relationship among voltage-versus-time discharge curves.

B88-10229

IMPINGEMENT OF ROCKET EXHAUST

BRET G. DRAKE (McDonnell-Douglas Corp.), and KENNETH S. LEAHY (McDonnell-Douglas Corp.)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21352

Vol. 12, No. 4, P. 40

Computer program calculates forces, heating, and contamination. Source Flow Impingement Program (SFPLIMP), a computer program that analyzes impingement of exhaust from several rocket engines on nearby surfaces in vacuum. Designed to calculate quickly undesired forces, heating, and contamination caused by firing attitude-control jets toward other surfaces of controlled spacecraft.

B88-10230

THERMAL CONDUCTANCES OF METAL CONTACTS

L. J. SALERNO, P. KITTEL, F. E. SCHERKENBACH, and A. L. SPIVAK (Trans-Bay Electronics, Inc.)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11777

Vol. 12, No. 4, P. 40

Report presents results of measurements of thermal conductances of aluminum and stainless-steel contacts at temperatures from 1.6 to 6.0 K. Measurement apparatus includes gearmotor assembly connected to rocker arm by music wire to load sample pair with forces up to 670 N. Heater placed above upper sample. Germanium resistance thermometers in upper and lower samples measured temperature difference across interface over range of heater powers from 0.1 to 10.0 mW. The thermal conductance calculated from temperature difference. Measurements provide data for prediction of thermal conductances of bolted joints in cryogenic infrared instruments.

B88-10231

LONG-LIVED GLASS MIRRORS FOR OUTER SPACE

FRANK L. BOUQUET (Caltech), CARL R. MAAG (Caltech), and PHILIP M. HEGGEN (Energy General)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17047

Vol. 12, No. 4, P. 41

Paper summarizes available knowledge about glass mirrors for use in outer space. Strengths and weaknesses of various types of first and second reflective surfaces identified. Second-surface glass mirrors used in outer space designed to different criteria more stringent for terrestrial mirrors. Protons, electrons, cosmic rays, meteorites, and orbiting space debris affect longevities of components. Contamination also factor in space.

B88-10232

ESTIMATING ELECTRON CONTENT OF THE IONOSPHERE

G. E. LANYI (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16923

Vol. 12, No. 4, P. 41

Method for estimation total electron content of ionosphere. Based on measurements of signals transmitted from global positioning satellites (GPS's). Ionospheric delays obtained by measuring differential arrival times of signals at two different frequencies. Since GPS observations cover certain regions of sky, location of space probe to be calibrated might not overlap GPS field of view. Certain assumptions made about behavior of ionosphere so total electron content estimated in any direction from receiver.

B88-10233

APPROXIMATIONS FOR PREDICTING ELECTROSTATIC DISCHARGES

LARRY D. EDMONDS (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17065

Vol. 12, No. 4, P. 41

Report provides approximate equations for capacitances and ratios of maximum electrostatic field strengths to potentials of variously shaped electrodes in vicinity of ground planes. Maximum-field-strength/potential ratio of given electrode used in conjunction with measured or estimated potential to determine whether discharge is likely. Capacitance and potential give measure of maximum energy release and maximum damage done by discharge.

B88-10278

DEPOLARIZATION-MEASURING DEVICE

JOSE M. ALVAREZ

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13621

Vol. 12, No. 5, P. 40

Knowledge of radiation in lidar channel enables determination of depolarization ratio. Device rotates lidar return prior to detection, introducing known amount of radiation into perpendicular lidar channel. Knowledge of amount of radiation interpreted in terms of relative optical/electronic gain ratio between data collected by parallel and perpendicular channels and depolarization scattering medium introduced into linearly-parallel-polarized incident beam.

B88-10279

LOW-THRESHOLD, SOLAR-PUMPED C2F5I LASER

RUSSELL J. DEYOUNG, and WILLARD R. WEAVER

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13677

Vol. 12, No. 5, P. 40

Laser threshold of 100 solar constants achieved. Using two xenon-arc solar simulators, lasing achieved with pentafluoroethyl iodide, a new alkyl iodide, at laser threshold of only 100 solar constants. Solar laser had lowest threshold observed to date. Output power and energy 350 mW and 45 mJ.

B88-10280

SHORT-CYCLE ADSORPTION REFRIGERATOR

C. K. CHAN (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16571

Vol. 12, No. 5, P. 41

Modular adsorption/Joule-Thomson-effect refrigerator offers

fast regeneration; adsorption/desorption cycle time expected to be 1 minute. Pressurized hydrogen generated by bank of compressor modules during heating phase passes through system of check valves and expands in Joule-Thomson junction as it enters refrigeration chamber. Hydrogen absorbs heat from load before it is sucked out by another bank of compressor modules in cooling phase.

B88-10281**GENERATING HYPERTHERMAL ATOMIC OXYGEN**

RONALD A. OUTLAW

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18629)

LAR-13652**Vol. 12, No. 5, P. 42**

Atomic oxygen diffused through silver desorbed by low-energy electron impact. Oxygen atoms diffuse through silver foil and emerge on high-vacuum side, aided by electron-stimulated desorption. Atomic-oxygen flux levels range up to 10 to the 12th power cm to the negative 2 power S to the negative 1 power, and kinetic energies range from 1 to 10 eV. O positive and O negative ions swept aside by charged cylindrical grids.

B88-10282**INFRARED ATTENUATION OF THALLIUM BROMIODIDE FIBERS**

JOHN GOEBEL, and BERYL MAGILAVY (Sterling Software)

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-32268)

ARC-11752**Vol. 12, No. 5, P. 44**

Report presents measurements of attenuation of infrared signals in unclad 381-micrometer-diameter optical fibers of thallium bromiodide. Measurements of attenuation in Tl(Br,I) fibers in wavelength ranges of 1.2 to 3.4 micrometer and 3 to 11 micrometer compare with those of two other groups of researchers.

B88-10283**RELIABILITY OF INSPECTION BY SLAM**

DON J. ROTH, STANLEY J. KLIMA, JAMES D. KISER, and GEORGE Y. BAAKLINI (Cleveland State University)

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N85-32337)

LEW-14633**Vol. 12, No. 5, P. 47**

Scanning laser acoustic microscopy finds flaws in ceramic specimens. Laser light used to detect distortions, on angstrom scale, produced on surface of specimen by ultrasonic waves transmitted through specimen. From distortion, SLAM creates picture on video monitor of such defects as voids, inclusions, and cracks.

B88-10343**COMPACT HO:YLF LASER**

H. HEMMATI (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17282**Vol. 12, No. 6, P. 66**

Longitudinal pumping by laser diodes increases efficiency. Improved holmium:yttrium lithium fluoride laser radiates as much as 56 mW of power at wavelength of 2.1 micrometer. New Ho:YLF laser more compact and efficient than older, more powerful devices of this type. Compact, efficient Ho:YLF laser based on recent successes in use of diode lasers to pump other types of solid-state lasers.

B88-10344**EVAPORATION AND IGNITION OF DENSE FUEL SPRAYS**

JOSETTE BELLAN (Caltech), and KENNETH G. HARSTAD

(Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16954**Vol. 12, No. 6, P. 66**

Simple theoretical model makes useful predictions of trends. Pair of reports presents theoretical model of evaporation and ignition of sprayed liquid fuel. Developed as part of research in combustion of oil and liquid fuels derived from coal, tar sand, and shale in furnace. Work eventually contributes to increase efficiency of combustion and decrease pollution generated by burning of such fuels.

B88-10372**QUICK-CHANGE OPTICAL-FILTER HOLDER**

PETER LEONE

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13148**Vol. 12, No. 7, P. 40**

Dark slide and interlock protect against ambient light. Quick-change filter holder contains interlocking mechanism preventing simultaneous removal of both dark slide and filter drawer. Designed for use with Band pass optical filters in 10 channels leading to photomultiplier tubes in water-vapor lidar/ozone instrument, mechanism can be modified to operate in other optical systems requiring optical change in filters.

B88-10373**DEVICE MAINTAINS WATER AT THE TRIPLE POINT**

J. W. WEST (Wyle Laboratories), and C. G. BURKETT (Wyle Laboratories)

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13708**Vol. 12, No. 7, P. 42**

Inexpensive device maintains water at 0.01 degree C for 10 weeks or longer. New device consists of four basic assemblies; small, commercial chest freezer containing insulated water tank; insulated copper cell holder; 'ice switch' for cycling freezer compressor and externally-mounted air pump for circulation. Access hole in freezer lid allows triple point measurements without opening lid. Modified freezer used to calibrate standard platinum resistance thermometers.

B88-10374**HOLOCINEMATOGRAPHIC VELOCIMETER**

LEONARD M. WEINSTEIN, and GEORGE B. BEELER

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13699**Vol. 12, No. 7, P. 44**

Holographic movies used to study turbulent flows. High-speed movie composed of single-exposure holograms of tracer particles in each of two simultaneous orthogonal views of flow. Time resolution set by movie frame rate, and total time limited by length of movie. Data from system used to verify results of theoretical models and numerical simulations of turbulence, visualize and measure coherent structures in 'non-simple' turbulent flows, to examine mechanisms operative in various turbulence-control/drag-reduction concepts.

B88-10375**SIMULTANEOUS SAMPLING OF TWO SPECTRAL SOURCES**

OLIN JARRETT, JR.

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13756**Vol. 12, No. 7, P. 44**

New technique uses bundle of fiber optics to sample a dye laser and a spectral lamp simultaneously. By use of real-time

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display with this sampling technique, two signals superimposed, and effect of any spectral adjustments determined immediately. System used to diagnose combustion.

B88-10381

PROGRAM COLLECTS AND ANALYZES THERMOELECTRIC DATA

ART B. CHMIELEWSKI (Caltech), and CHARLES WOOD (Caltech)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17149

Vol. 12, No. 7, P. 54

Large gradient seebeck coefficient measurement computer program gathers many channels of data, performs analysis, and plots each set of data simultaneously. User can modify code to alter number of channels of data collected and sampling rate and equations that process data. Written in HP Basic. Program also adaptable to other types of data.

B88-10409

PHOTOMETER TRACKS THE SUN

TAK MATSUMOTO, CESAR MINA, PHILIP RUSSELL, and WILLIAM VAN ARK

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11622

Vol. 12, No. 8, P. 41

Airborne Sun-tracking photometer enables observations of Sun during much greater portion of flights than previously possible, without special maneuvers of airplane. Instrument occupies dome atop airplane. Fiberglass dome protects photometer and rotates to aim photometer in azimuth and elevation to track Sun. Provides controlled environment for instrument, including mechanical and electronic parts. Instrument calibrated without removing it from airplane.

B88-10410

STAND FOR INFRARED MULTIPLE-INTERNAL-REFLECTION MOUNT

EDWARD R. LONG, JR., and CYNTHIA A. BRADBURY (Old Dominion University)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13610

Vol. 12, No. 8, P. 44

Infrared MIR spectra more reproducible, and MIR crystal suffers less damage. Technique prevents lateral movement between elements in multiple-internal-reflection (MIR) cell during assembly. Reproducibility of infrared MIR spectra relies on ability to maintain condition of crystal, which is MIR element, and to control contact between crystal and sample. Cell used in infrared spectroscopy.

B88-10411

FURNACE FOR RAPID MELTING AND FREEZING

EDWIN C. ETHRIDGE

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28195

Vol. 12, No. 8, P. 44

Proposed furnace rapidly heats and cools specimens in material-processing experiments. Preheated specimen heated rapidly above melting temperature by contact with hotter, more massive object. Once molten, cooled rapidly with flowing gas. Particularly useful for experiments requiring artificial low gravitation produced by flying KC-135 airplanes in parabolic trajectories.

B88-10412

LASER PYROMETER FOR SPOT TEMPERATURE MEASUREMENTS

D. D. ELLEMAN (Caltech), J. L. ALLEN (Caltech), and M. C. LEE (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17024

Vol. 12, No. 8, P. 48

Laser pyrometer makes temperature map by scanning measuring spot across target. Scanning laser pyrometer passively measures radiation emitted by scanned spot on target and calibrated by similar passive measurement on blackbody of known temperature. Laser beam turned on for active measurements of reflectances of target spot and reflectance standard. From measurements, temperature of target spot inferred. Pyrometer useful for non-contact measurement of temperature distributions in processing of materials.

B88-10413

TEMPERATURE FLUCTUATIONS DURING CRYSTAL GROWTH

ARCHIBALD L. FRIPP, JR., IVAN O. CLARK, WILLIAM J. DEBNAM, JR., PATRICK G. BARBER (Longwood College), ROGER K. CROUCH (NASA Headquarters), and RICHARD T. SIMCHICK (PRC Kentron, Inc.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13670

Vol. 12, No. 8, P. 48

Technique developed to deconvolve period and relative amplitude of fluctuations of heat flow in Bridgman crystal growth. Temperature-measuring device with enough sensitivity and frequency response to make desired measurements inserted close as possible to substance monitored. Time-dependent temperature response recorded, and time domain response converted to frequency domain for further analysis. Fast Fourier transform (FFT) of data on temperature oscillations shows particular behavior at some specific frequencies corresponding with striations, or defects observed on crystal. Useful procedure to help determine sources of some growth-induced crystalline defects. Other processes sensitive to small temperature fluctuations, such as diffusion, precipitation, and corrosion, benefit from technique.

B88-10414

DETECTING SPACE DUST PARTICLES

WILLIAM H. KINARD, DONALD H. HUMES, PHILIP C. KASSEL, JR., JIM WORTMAN (North Carolina State University), S. FRED SINGER (University of Virginia), and JOHN STANLEY (University of Virginia)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13392

Vol. 12, No. 8, P. 52

Technique records times specific craters formed in targets exposed in space and permits determination of direction in which impacting particles traveled at times of impacts. MOS capacitor is short-circuited by impact of particle striking at high speed. After recovery of targets from space, compositions of impacting particles established through post-flight laboratory analyses of residual materials in craters. On earth technique has industrial and military uses in detection of fragments driven by explosions. Studies of orbital dynamics of particles produced by solid-propellant rocket-motor firings in space made using technique.

B88-10415

STATUS OF SORPTION CRYOGENIC REFRIGERATION

JACK A. JONES (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17349

Vol. 12, No. 8, P. 53

Report reviews sorption refrigeration. Developed for cooling

infrared detectors, cryogenic research, and other advanced applications, sorption refrigerators have few moving parts, little vibration, and lifetimes of 10 years or more. Describes types of sorption stages, multistage and hybrid refrigeration systems, power requirements, cooling capacities, and advantages and disadvantages of various stages and systems.

B88-10425

FOUR-DIMENSIONAL GLOBAL REFERENCE-ATMOSPHERE MODEL

DALE JOHNSON, and RHONDA S. BLOCKER (Boeing Support Services)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28293

Vol. 12, No. 8, P. 62

Four-Dimensional Global Reference Atmosphere Model (GRAM) computer program developed from empirical atmospheric model generating values for pressure, density, temperature, and winds, from ground to orbital altitudes. Is amalgamation of two empirical atmospheric models for low and high atmosphere with newly-developed latitude-and longitude-dependent model for middle atmosphere. UNIVAC version written in UNIVAC FORTRAN. DEC VAX version of GRAM written in FORTRAN 77. Applications include simulation of reentry trajectories of external tanks, studies of global circulation and diffusion and generation of plots or data for comparison.

B88-10473

MEASURING FLOW WITH LASER-SPECKLE VELOCIMETRY

C. A. SMITH, L. M. M. LOURENCO (Florida State University), and A. KROTHAPALLI (Florida State University)

Oct. 1988 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A86-37091)

ARC-11766

Vol. 12, No. 9, P. 56

Spatial resolution sufficient for calculation of vorticity. In laser-speckle velocimetry, pulsed or chopped laser beam expanded in one dimension by cylindrical lens to illuminate thin, fan-shaped region of flow measured. Flow seeded by small particles. Lens with optical axis perpendicular to illuminating beam forms image of illuminated particles on photographic plate. Speckle pattern of laser-illuminated, seeded flow recorded in multiple-exposure photographs and processed to extract data on velocity field. Technique suited for study of vortical flows like those about helicopter rotor blades or airplane wings at high angles of attack.

B88-10474

SIMPLIFIED MICROWAVE RADIOMETER

BRUCE L. GARY (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17101

Vol. 12, No. 9, P. 57

Cost, weight, and size less than half of conventional radiometers. Ground-based instrument measures temperatures in upper atmosphere while correcting for liquid water in clouds. Addition of channel at 51 GHz to channels used for making upper-atmosphere temperature profiles adds little to cost of microwave radiometer. Eliminates need for separate water-vapor radiometer subsystem, with its attendant size, weight, and cost. Instrument light, compact, and portable and inexpensive enough for use in sensor arrays. Availability encourages use of microwave radiometry for routine weather forecasting.

B88-10475

CONTROLLING VAPOR PRESSURE IN HANGING-DROP CRYSTALLIZATION

DANIEL C. CARTER, and ROBBIE SMITH

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26056

Vol. 12, No. 9, P. 57

Rate of evaporation adjusted to produce larger crystals. Device helps to control vapor pressure of water and other solvents in vicinity of hanging drop of solution containing dissolved enzyme protein. Well of porous frit (sintered glass) holds solution in proximity to drop of solution containing protein or enzyme. Vapor from solution in frit controls evaporation of solvent from drop to control precipitation of protein or enzyme. With device, rate of nucleation limited to decrease number and increase size (and perhaps quality) of crystals - large crystals of higher quality needed for x-ray diffraction studies of macromolecules.

B88-10476

IMPROVED STATE SELECTION FOR HYDROGEN MASERS

ROBERT F. C. VESSOT (Smithsonian Institution), and EDWARD M. MATTISON (Smithsonian Institution)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17114

Vol. 12, No. 9, P. 58

Improved selection system for hydrogen maser helps exclude hydrogen atoms from storage bulb in undesired quantum states not contributing to amplification/oscillation process. Atoms in undesired states limit stability of maser by reducing storage lifetime of atoms in desired state, reducing output power, and colliding with atoms in desired state under circumstances that causing systematic shifts in frequency.

B88-10477

CALCULATING OPTICAL-TRANSMITTER RADIATION PATTERN S

WILLIAM K. MARSHALL (Caltech), and BRIAN D. BURK (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17105

Vol. 12, No. 9, P. 59

New formula gives more-accurate gains and pointing losses. Set of approximate formulas predicts angular dependence of far radiation field coherent optical transmitter, telescope having central obscuring disk. Formulas derived without recourse to simplifying assumption of uniform plane-wave illumination used to derive less-accurate traditional formulas.

B88-10478

COMPUTERIZED ANALYSIS OF THERMAL-DIFFUSIVITY DATA

ARTUR B. CHMIELEWSKI (Caltech), CHARLES WOOD (Caltech), and JAN W. VANDERSANDE (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16729

Vol. 12, No. 9, P. 60

Improved data-acquisition and data-analysis system for thermal-diffusivity measurements using flash method incorporates digital oscilloscope and microcomputer for rapid reduction of experimental data. In thermal-diffusivity apparatus thin specimen heated on one face by pulsed xenon flashlamp, subsequent temperature rise on opposite face monitored by infrared detector. Thermal diffusivity estimated from thickness of specimen and from time after initial pulse during which temperature rise reaches half maximum value. Accuracy of estimate improved by correcting temperature measurements for radiative loss of heat from specimen and for finite duration and specific waveform of flashlamp pulse. System devised for use in high-temperature measurements of thermoelectric materials.

03 PHYSICAL SCIENCES

B88-10479

ERROR-TOLERANT QUASI-PARABOLOIDAL SOLAR CONCENTRATOR

HOWARD A. WAGNER

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21061

Vol. 12, No. 9, P. 62

Scalloping reflector surface reduces sensitivity to manufacturing and aiming errors. Contrary to intuition, most effective shape of concentrating reflector for solar heat engine is not perfect paraboloid. According to design studies for Space Station solar concentrator, scalloped, nonimaging approximation to perfect paraboloid offers better overall performance in view of finite apparent size of Sun, imperfections of real equipment, and cost of accommodating these complexities. Scalloped-reflector concept also applied to improve performance while reducing cost of manufacturing and operation of terrestrial solar concentrator.

B88-10480

CALCULATING SHOCKS IN FLOWS AT CHEMICAL EQUILIBRIUM

SCOTT EBERHARDT, and GRANT PALMER

Oct. 1988 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A86-39896)

ARC-11741

Vol. 12, No. 9, P. 64

Boundary conditions prove critical. Conference paper describes algorithm for calculation of shocks in hypersonic flows of gases at chemical equilibrium. Although algorithm represents intermediate stage in development of reliable, accurate computer code for two-dimensional flow, research leading up to it contributes to understanding of what is needed to complete task.

B88-10481

OPTICAL IMAGE SUBTRACTION

HUA-KUANG LIU (Caltech), and TIEN-HSIN CHAO (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17016

Vol. 12, No. 9, P. 65

Report reviews optical image subtraction techniques developed during years 1975 through 1985. Useful in such disciplines as studies of earth resources, meteorology, automatic surveillance, pattern recognition, studies of urban growth, and compression of bandwidth in communication systems. Describes following real-time techniques: source encoding, polarization modulation, pseudocolor image-difference detection, holographic-shear-lens technique, and nonlinear electro-optics. Reported non-real-time image-subtraction techniques are following, all of which involve intensity subtraction: speckle-diffuser encoding, speckle-pattern encoding, halftone-screen encoding, and polarization-shifted carrier encoding. Offers an attractive alternative to digital electronic image subtraction, is faster and treats all parts of images simultaneously.

B88-10519

PULSED SOURCE OF ENERGETIC OXYGEN ATOMS

GEORGE CALEDONIA (Physical Sciences, Inc.), ROBERT KRECH (Physical Sciences, Inc.), DAVID GREEN (Physical Sciences, Inc.), and ANTHONY PIRRI (Physical Sciences, Inc.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-30000

Vol. 12, No. 10, P. 42

Apparatus developed that generates high-flux pulses of oxygen atoms to bombard specimens in experiments on aging and degradation of materials in low Earth-orbit environment. Preliminary studies of specimens irradiated with atomic oxygen provided spectral evidence of erosion, in addition to measurable mass loss.

Intense atomic oxygen pulses also useful in studies of microfabrication techniques.

B88-10520

HIGH-PERFORMANCE AMBIENT-TEMPERATURE HEAT PIPE

MICHAEL D. KEDDY (Thermacore, Inc.), NELSON J. GERNERT (Thermacore, Inc.), and JAMES W. OWEN (Thermacore, Inc.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26062

Vol. 12, No. 10, P. 43

Heat pipe with two channels designed for regulation of temperature in enclosed spaces. Made of aluminum, heat-transfer material is ammonia. Contains two channels: one for vapor phase and one for liquid phase of ammonia. Porous wick of sintered aluminum powder lines vapor channel and fills slot between two channels. Design confers several advantages.

B88-10521

TRANSFERRING HEAT IN CONJUGATING BINARY LIQUIDS

P. G. GRODZKA (Lockheed Missiles & Space Co.), and J. W. OWEN (Lockheed Missiles & Space Co.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28249

Vol. 12, No. 10, P. 43

Conjugating binary liquids proposed for use as phase-change heat-transfer fluids. Phase diagrams illustrate more common types of mixing and separation of conjugating binary liquids.

B88-10522

MOUNTING THIN SAMPLES FOR ELECTRICAL MEASUREMENTS

L. G. MATUS, and R. L. SUMMERS

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14646

Vol. 12, No. 10, P. 46

New method for mounting thin sample for electrical measurements involves use of vacuum chuck to hold a ceramic mounting plate, which holds sample. Contacts on mounting plate establish electrical connection to sample. Used to make electrical measurements over temperature range from 77 to 1,000 K and does not introduce distortions into magnetic field during Hall measurements.

B88-10523

LIQUID-CRYSTAL-TELEVISION IMAGE SUBTRACTORS

TIEN-HSIN CHAO (Caltech), and HUA-KUANG LIU (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17144

Vol. 12, No. 10, P. 48

Two image-subtraction systems from output images that show differences between input images of two objects. First: differences appear as bright regions in otherwise dark output image. Second: differences and similarities shown by colors. All parts of two images processed simultaneously by optical components only; digital electronic processing of data not required. Concept offers potential for rapid, inexpensive comparison of images in such applications as automatic inspection, medical diagnosis, and robotic vision.

B88-10574

CHOPPING-WHEEL OPTICAL ATTENUATOR

DOUGLAS B. LEVITON

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13139

Vol. 12, No. 11, P. 42

Star-shaped rotating chopping wheel provides adjustable

time-averaged attenuation of narrow beam of light without changing length of optical path or spectral distribution of light. Duty cycle or attenuation factor of chopped beam controlled by adjusting radius at which beam intersects wheel. Attenuation factor independent of wavelength. Useful in systems in which chopping frequency above frequency-response limits of photodetectors receiving chopped light. Used in systems using synchronous detection with lock-in amplifiers.

B88-10575**MATHEMATICAL MODEL FOR SCATTERING FROM MIRRORS**
YAUJEN WANG (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17050**Vol. 12, No. 11, P. 42**

Additional terms account for effects of particulate contamination. Semiempirical mathematical model of scattering of light from surface of mirror gives improved account of effects of particulate contamination. Models that treated only scattering by microscopic irregularities in surface gave bidirectional reflectance distribution functions differing from measured scattering intensities over some ranges of angles.

B88-10576**NUMERICAL MODELING OF TWO-PHASE, REACTIVE FLOWS**
PAK-YAN LIANG (Rockwell International Corp.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29027**Vol. 12, No. 11, P. 44**

Capabilities of several computational schemes combined and enhanced. Advanced Rocket Injector-Combustor Code is computer program for numerical simulation of two-phase flows of chemically reacting or nonreacting components. Applied to sprays of fuel in injectors and combustors, flows in heat exchangers, evaporators, and mass-diffusion systems; and two-dimensional or axisymmetric flows containing liquid or solid suspensions. Used in research for development and verification of various physical models.

B88-10577**THERMOGRAPHIC INSPECTION OF COATINGS**

W. A. RIEHL (United Technologies Corp.), and P. W. HAYES (United Technologies Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28258**Vol. 12, No. 11, P. 46**

Use of infrared thermography proposed for inspection of some kinds of coatings. Sample heated radiantly from behind viewed by infrared thermography. Defects in coating visible at infrared wavelengths. Inspection technique executed by remote scanning or robotic scanning with automatic electronic detection of anomalies.

B88-10578**BEAM DIRECTOR FOR OPTICAL PYROMETER**

LYNN M. WYETT (Rockwell International Corp.), and MICHAEL R. RANDALL (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29283**Vol. 12, No. 11, P. 46**

Optical-fiber pyrometer under development observes fields of view as much as 31 degree off axis. Prismlike end fitting bends viewing angle so pyrometer can 'look' at object off axis. Angled face directs thermal radiation from object into optical-fiber cable along axis.

B88-10579**OPTICAL SENSOR OF HIGH GAS TEMPERATURES**

ARTHUR J. HILL (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29316**Vol. 12, No. 11, P. 48**

Contact pyrometer resists effects of heat, vibration, and moisture. New sensor consists of shielded sapphire rod with sputtered layer of precious metal on end. Metal layer acts as blackbody. Emits radiation having known dependence of spectral distribution with temperature of metal and temperature of hot gas flowing over metal. Fiber-optic cable carries radiation from sapphire rod to remote photodetector.

B88-10580**MAKING HYDROGEN FLAMES VISIBLE**

JOSEPH P. BROWN (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29406**Vol. 12, No. 11, P. 48**

Invisible to unaided eye, flames seen with special infrared camera. Modification of standard, commercial video camera enables it to create images of hydrogen fires.

B88-10581**X-RAY-SCATTERING MEASUREMENTS OF STRAIN IN PEEK**

PEGGY CEBE (Caltech), LYNN E. LOWRY (Caltech), SHIRLEY Y. CHUNG (Caltech), ANDRE H. YAVROUIAN (Caltech), and AMITAVA GUPTA (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17097**Vol. 12, No. 11, P. 50**

Internal stress relieved by heating above glass-transition temperature. Report describes wide-angle x-ray scattering and differential scanning calorimetry of specimens of poly(etheretherketone) having undergone various thermal treatments. Wide-angle x-ray scattering particularly useful in determining distances between atoms, crystallinity, and related microstructurally generated phenomena, as thermal expansion and strain. Calorimetric measurements aid interpretation of scattering measurements by enabling correlation with thermal effects.

B88-10582**INFRARED REMOTE SENSING OF THE MARTIAN ATMOSPHERE**

D. J. MCLEESE (Caltech), J. T. SCHOFIELD (Caltech), R. W. ZUREK (Caltech), J. V. MARTONCHIK (Caltech), R. D. HASKINS (Caltech), D. A. PAIGE (Caltech), R. A. WEST (Caltech), D. J. DINER (Caltech), J. R. LOCKE (Caltech), M. P. CHRISP (Caltech) et al.

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17353**Vol. 12, No. 11, P. 52**

Distributions of temperature dust, vapors, and condensates measured. Report describes design and intended uses of developmental pressure-modulator infrared readimeter, PMIRR, carried aboard Mars Observer spacecraft. Applies remote-sensing techniques used to study atmosphere of Earth. Takes similar measurements from polar orbit around Mars. Nine-channel atmospheric sounder that employs filter and pressure-modulation gas-correlation infrared radiometry.

B88-10583**EFFECT OF WATER ON PERMEATION BY HYDROGEN**

WILLIAM A. TOMAZIC, and DAVID HULLIGAN (Sverdrup Technology, Inc.)

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Dec. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16664)

LEW-14648 Vol. 12, No. 11, P. 52

Water vapor in working fluid equilibrates with permeability-reducing oxides in metal parts. Report describes study of effects of water on permeation of heater-head tubes by hydrogen in Stirling engine. Experiments performed to determine minimum concentration of oxygen and/or oxygen-bearing gas maintaining oxide coverage adequate for low permeability. Tests showed 750 ppm or more of water effective in maintaining stable, low permeability.

B89-10017

PHOTOVOLTAIC HYDROGEN SENSOR

TAHER DAUD (Caltech), JAMES R. JANESICK (Caltech), and JOHN LAMBE (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17124 Vol. 13, No. 1, P. 36

Photovoltaic device senses hydrogen developed to test degradation of diodes with platinum flash gates on backs. Sensing element is p/n junction rather than conventional Schottky barrier or metal oxide/silicon field-effect transistor. Hydrogen-indicating electrical signal modulated optically rather than electrically. Layered structure of hydrogen detector and principle of operation resemble silicon solar photovoltaic cell. Hydrogen detector responds to hydrogen in atmosphere within minutes and recovers quickly when hydrogen removed.

B89-10018

EVOLUTION OF CENOSPHERES

EUG Y. KWACK (Caltech), PARTHASARATHY SHAKKOTTAI (Caltech), PAUL F. MASSIER (Caltech), and LLOYD H. BACK (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17239 Vol. 13, No. 1, P. 37

Microscopy reveals changes in structure during combustion. Experiments performed to trace evolution of structures of droplets of burning fuel oil. Many droplets burn incompletely, forming cenospheres. Knowledge of structure at various stages of combustion process contributes to efforts to design equipment to burn cenospheres.

B89-10019

CHARACTERISTICS OF CENOSPHERES

RICHARD M. CLAYTON (Caltech), and LLOYD H. BACK (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17236 Vol. 13, No. 1, P. 38

Studies conducted to determine structure and composition of cenospheres. Burn more slowly than original fuel, contribute to deposits, high-temperature corrosion, emissions of particles, and reduced efficiency of combustion in oil-fired furnaces and boilers, accounting 3 percent of original fuel in droplets. Contributes to efforts to burn fuel oil more completely to avoid deleterious effects of incomplete combustion.

B89-10020

OXIDATION OF REFLECTORS THROUGH PINHOLES IN COATINGS

DANIEL A. GULINO

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-11838)

LEW-14649

Vol. 13, No. 1, P. 38

Impacts of particles create paths for corrosion by monatomic oxygen. Report describes experiments to determine effects of monatomic oxygen on reflectors damaged by hard particles. Applies to reflectors for solar dynamic power systems in low orbit around Earth, where neutral monatomic oxygen major constituent of atmosphere. Species highly corrosive and attacks variety of materials.

B89-10059

CALIBRATION-TUBE DEWAR

DONALD B. HERLTH, and DEAN P. OHARA (San Jose State University)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12119 Vol. 13, No. 2, P. 48

Container maintains reference material for gas chromatography at constant temperature for extended periods. Developed for holding peroxyacetylnitrate (PAN), material unstable at room temperature but stable at 0 degree C. Keeps vial of PAN at this temperature by immersing in mixture of water and ice. Perforated tube surrounds vial, protects from damage by ice but allows cold water to circulate around. Plug with handle removable so ice added through filler tube. O-rings seal joints around removable parts. Substances undergoing phase changes at other temperatures substituted for ice and water if different reference materials and storage temperatures used. Used on research aircraft collecting and analyzing air samples in troposphere and stratosphere.

B89-10060

JOULE-THOMSON EXPANDER WITHOUT CHECK VALVES

C. K. CHAN (Caltech), and J. R. GATEWOOD (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17143 Vol. 13, No. 2, P. 49

Cooling effected by bidirectional, reciprocating flow of gas. Type of Joule-Thomson (J-T) expander for cryogenic cooling requires no check valves to prevent reverse flow of coolant. More reliable than conventional J-T expander, containing network of check valves, each potential source of failure. Gas flows alternately from left to right and right to left. Heat load cooled by evaporation of liquid from left or right compartment, whichever at lower pressure.

B89-10061

IDENTIFICATION OF ANOMALIES IN WELDS

DAVID G. KNICHEN (Martin Marietta Corp.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28285 Vol. 13, No. 2, P. 50

Advanced techniques combined with conventional analytical methods. Combination of real-time radiography, scanning electron microscopy, and energy-dispersive spectrometry identify enigmatic features in radiographs of welds where standard tensile, hardness, and electrical-conductivity tests and visible-light microscopic and macroscopic examinations insufficient. New combination of techniques applied successfully to variable-polarity-plasma-arc welds of 2219 aluminum alloy. Joints subjected to penetration, fill, and weld-repair passes with 2319 aluminum weld wire.

B89-10062

HIGH TEMPERATURE GAS-GAP THERMAL SWITCH

STEVEN BARD (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17163**Vol. 13, No. 2, P. 50**

Device set to allow heat to flow across gap (switch 'on') or decrease rate of transfer of heat to relatively low value (switch 'off'). Operates at temperatures in approximate range of 100 to 1,500 degree C. Central cylindrical object thermally connected to (or disconnected from) environment by filling gap between inner and outer sleeves of switch (or evacuating gap) to increase (or decrease) thermal conduction across gap.

B89-10063**CARBON SORPTION CRYOGENIC REGENERATOR**

JACK A. JONES (Caltech), S. WALTER PETRICK (Caltech), and MICHAEL J. BRITCLIFFE (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17291**Vol. 13, No. 2, P. 52**

Liquid-helium refrigerator includes regenerator filled with carbon sorbent made from Saran polyvinylidene chloride. Material results in lower operating temperatures and longer times between maintenance than comparable refrigerators containing other regenerators. Sorbent material machined to various configurations to fit inside cylindrical regenerator can. Configuration chosen with regard to heat capacity, pressure drop, and rate of sorption.

B89-10064**PHASE SEPARATORS AND FOUNTAIN-EFFECT PUMPS FOR HE 11**

PAUL L. WHITEHOUSE

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28243**Vol. 13, No. 2, P. 54**

Fused-glass microchannel arrays for use as HE 11 phase separators and fountain-effect pumps. Microchannel devices for use in low-gravity storage and cooling systems containing superfluid helium. Phase separators and pumps take advantage of thermomechanical effect peculiar to He 11 in restricted spaces. By creating thermal gradient in porous plug, direction of flow reversed, turning phase separator into pump. However, addition of heat disadvantage. Thermal gradient created by using Peltier effect to transfer heat across array, removing heat from He 11 supply and overcoming undesirable addition of heat.

B89-10117**CORRELATION FUNCTIONS AID ANALYSES OF SPECTRA**

REINHARD BEER (Caltech), and ROBERT H. NORTON, JR. (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17306**Vol. 13, No. 3, P. 50**

New uses found for correlation functions in analyses of spectra. In approach combining elements of both pattern-recognition and traditional spectral-analysis techniques, spectral lines identified in data appear useless at first glance because they are dominated by noise. New approach particularly useful in measurement of concentrations of rare species of molecules in atmosphere.

B89-10118**ACOUSTICAL MEASUREMENT OF FURNACE TEMPERATURES**

SHAKKOTTAI PARTHASARATHY (Caltech), and SHAKKOTTAI P. VENKATESHAN (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17007**Vol. 13, No. 3, P. 51**

Simple probes withstand severe conditions, yet give

spatially-resolved temperature readings. Prototype acoustical system developed to measure temperatures from ambient to 1,800 degree F in such structures as large industrial lime kilns and recovery-boiler furnaces. Pulses of sound reflected from obstructions in sensing tube. Speed of sound and temperature in each segment deduced from travel times of pulses.

B89-10119**PHASE-MODULATION GAS-CORRELATION SPECTROSCOPY**

DAVID M. RIDER (Caltech), JOHN T. SCHOFIELD (Caltech), JACK S. MARGOLIS (Caltech), and DANIEL J. MCCLEESE (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17013**Vol. 13, No. 3, P. 52**

Electro-optic phase-modulation gas-correlation spectroscopy demonstrated in laboratory tests promising candidate technique for remote sensing of gases, temperatures, and wind velocities in atmosphere. In technique radiation emitted by sample atmosphere passed through electro-optic phase modulator, and modulated and unmodulated versions of spectrum alternately passed through reference absorption cell containing gas to be detected. Radiation emerging from reference cell band-pass filtered and detected. Correlation signal is difference in intensity between phase-modulated and unmodulated detected signals.

B89-10120**ELECTROLYTIC HEAT SWITCH**

MILES WALSH (Cape Cod Research), GREGORY D'ANDREA (Cape Cod Research), JOSEPH ADELSTEIN (Cape Cod Research), BRIAN G. DIXON (Cape Cod Research), and R. SCOTT MORRIS (Cape Cod Research)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26074**Vol. 13, No. 3, P. 54**

Experiments demonstrated feasibility of electrolytic device of electrically-controllable thermal conductivity. Device includes inner ionomeric layer of low thermal conductivity sandwiched between two metal-foil electrodes. Device's ionomeric layer will be conductive polymer - perhaps polyaniline. In effect, device will be metal/conductive-polymer secondary electrical cell.

B89-10121**THERMAL-WAVE MICROSCOPE**

ROBERT E. JONES, IHOR KRAMARCHUK, WALLACE D. WILLIAMS, JOHN J. POUCH, and PERCY GILBERT (Purdue Univ.)

Mar. 1989 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

LEW-14740**Vol. 13, No. 3, P. 56**

Computer-controlled thermal-wave microscope developed to investigate III-V compound semiconductor devices and materials. Is nondestructive technique providing information on subsurface thermal features of solid samples. Furthermore, because this is subsurface technique, three-dimensional imaging also possible. Microscope uses intensity-modulated electron beam of modified scanning electron microscope to generate thermal waves in sample. Acoustic waves generated by thermal waves received by transducer and processed in computer to form images displayed on video display of microscope or recorded on magnetic disk.

B89-10122**SPECTROGRAPH MEASURES CONTAMINATION OF OPTICAL ELEMENTS**

BRUCE K. FLINT (Acton Research Corp.), ROBERT D. FANCY (Acton Research Corp.), and ROBERT V. JARRATT, JR. (Acton

03 PHYSICAL SCIENCES

Research Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26076

Vol. 13, No. 3, P. 58

Scanning-monochromator spectrograph designed to measure contamination on surfaces of optical elements as function of time. Repeatedly exposes samples to environment, then measures their transmittances or reflectances over range of wavelengths. Intended for use at vacuum-ultraviolet wavelengths to evaluate effects of outgassing, heating, and cooling on optical instruments. Principle of operation also applicable to spectral monitoring of time-dependent contamination at other wavelengths and in laboratory, industrial, or other settings.

B89-10128

TRANSFERRING LENS PRESCRIPTIONS BETWEEN LENS-DESIGN PROGRAMS

JOHN E. STACY (Caltech), LAURA WOOLEY (University of Rochester), and BRIAN CARLIN (Santa Barbara Research Center)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17092 NPO-17093

Vol. 13, No. 3, P. 64

Optical Lens Prescription Data Formatter computer program enables user to transfer complicated lens prescriptions quickly and easily from one major optical-design program to another and back again. One can take advantage of inherent strength of either program. Programs are ACCOS V from Scientific Calculations, Inc., of Fishers, NY, and CODE V from Optical Research Associates of Pasadena, CA. VAX version written in FORTRAN.

B89-10129

ISOTHERMAL-GAS-TRANSFER PROGRAM

DON I. LEVINE (Rockwell International Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21400

Vol. 13, No. 3, P. 64

Isothermal Gas Transfer program (GASXFER) solves variety of problems in which gas or gas mixture transferred between two containers. Special features of program include ease of entering data and ease of obtaining output. Program displays, prints, or graphs complete pressure history of each gas as function of time. Written in Lotus Symphony macrolanguage.

B89-10168

CLADDING FOR TRANSVERSELY-PUMPED LASER ROD

ROBERT L. BYER (Stanford Univ.), and TSO YEE FAN (Stanford Univ.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17355

Vol. 13, No. 4, P. 68

Combination of suitable dimensioning and cladding of neodymium:yttrium aluminum garnet of similar solid-state laser provides for more efficient utilization of transversely-incident pump light from diode lasers. New design overcomes some of limitations of longitudinal- and older transverse-pumping concepts and promotes operation at higher output powers in TEM₀₀ mode.

B89-10169

MAKING DISPLACED HOLOGRAMS AT TWO WAVELENGTHS

WILLIAM K. WITHEROW, and ANDREAS ECKER

Apr. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28242

Vol. 13, No. 4, P. 68

Two-wavelength holographic system augmented with pair of prisms to introduce small separation between holograms formed simultaneously at two wavelengths on holographic plate. Principal use in study of flows. Gradients in index of refraction of fluid caused by variations in temperature, concentration, or both. Holography at one wavelength cannot be used to distinguish between two types of variations. Difference between spacings of fringes in photographs reconstructed from holograms taken simultaneously at two different wavelengths manipulated mathematically to determine type of variation.

B89-10170

ELECTRON/ION-SCATTERING APPARATUS

ARA CHUTJIAN (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16789

Vol. 13, No. 4, P. 70

In new apparatus, most of electrons scattered inelastically over wide range of angles measured simultaneously, with consequent increase in signal-to-noise ratio by factor of about 10 to 4th power. Beam of electrons and beam of ions aimed along low-intensity magnetic field between pair of electric-field plates. Crossed electric and magnetic fields hardly affect ions but cause electrons to drift toward ions by trochoidal motion. With modifications, apparatus used for measurements of excitation cross sections in neutral atoms, molecules, radicals, and excited states of atoms and molecules.

B89-10171

MEASUREMENT OF COMPOSITION IN TRANSPARENT MODEL ALLOY

WILLIAM F. KAUKLER (University of Alabama), GRETCHEN L. PERRY (University of Alabama), and PETER A. CURRERI (University of Alabama)

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-15027)

MFS-26079

Vol. 13, No. 4, P. 72

Variation of FTIR technique developed to enable study of growth of cells of different solid phase in unidirectional solidification of these organic mixtures, which serve as transparent analogs of opaque monotectic metal alloys. Study of organic analogs expected to contribute to understanding of formation of aligned rods and particles in directional solidification of metal alloys. Advantage of technique is redistribution of material caused by solidification determined after fact, to very fine scale.

B89-10172

MODIFIED TECHNIQUE FOR CHEMISORPTION MEASUREMENTS

DAVID R. SCHRYER, KENNETH G. BROWN (Old Dominion Research Foundation), and JACQUELINE SCHRYER (Old Dominion Research Foundation)

Apr. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13725

Vol. 13, No. 4, P. 73

In measurements of chemisorption of CO on Pt/SnO₂ catalyst observed that if small numbers of relatively large volumes of adsorbate gas are passed through sample, very little removal of CO detected. In these cases little or no CO has been chemisorbed on Pt/SnO₂. Technique of using large number of small volumes of adsorbate gas to measure chemisorption applicable to many gas/material combinations other than CO on Pt/SnO₂. Volume used chosen so that at least 10 percent of adsorbate gas removed during each exposure.

B89-10173

MEASUREMENT OF MOLECULAR MOBILITIES OF POLYMERS

SOON SAM KIM (Caltech), and FUN-DOW TSAY (Caltech)
Apr. 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

NPO-17216 **Vol. 13, No. 4, P. 74**

New molecular-probe technique used to measure molecular mobility of polymer. Method based on use of time-resolved electron-spin resonance (ESR) spectroscopy to monitor decay of transient nutation amplitudes from photoexcited triplet states of probe molecules with which polymer is doped. The higher molecular mobility of polymer matrix, the faster nutation amplitudes of the probe molecules decay.

B89-10174

MEASURING SHAPES OF REFLECTORS BY MICROWAVE HOLOGRAPHY

Y. RAHMAT-SAMII (Caltech)

Apr. 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

NPO-17382 NPO-17268 **Vol. 13, No. 4, P. 74**

Pair of reports discusses theoretical foundation and recent theoretical and practical developments in use of microwave holography to measure surfaces of microwave antennas. (Second report abbreviated version of first report.) Microwave holographic measurements provide acceptable accuracy and are more convenient and less time consuming than optical and mechanical measurements, especially where measurements repeated. Microwave holographic metrology of large reflectors, first reported in 1976, improved into accurate technique with potential industrial applications.

B89-10175

REVIEW OF FIBER-OPTIC ELECTRIC-FIELD SENSORS

RAMON P. DE PAULA (Caltech), and JACEK JARZYNSKI (Georgia
Institute of Technology)

Apr. 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

NPO-17242 **Vol. 13, No. 4, P. 76**

Tutorial paper reviews state of art in fiber-optic sensors of alternating electric fields. Because such sensors are made entirely of dielectric materials, they are relatively transparent to incident electric fields; they do not distort fields significantly. Paper presents equations that express relationships among stress, strain, and electric field in piezoelectric plastic and equations for phase shift in terms of photoelastic coefficients and strains in optical fiber.

B89-10176

THEORY OF A PYROTECHNICALLY DRIVEN DEVICE

ROBERT RICHTER (Caltech)

Apr. 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

NPO-17117 **Vol. 13, No. 4, P. 76**

Report presents relations that predict behavior of pyrolytically operated device. Mathematical analysis motivated by need to evaluate performances of squib-driven release nuts. Analysis takes into account most significant of complicated interrelated processes involved in operation of pyrotechnically driven devices and aids in their design and evaluation of test data.

B89-10221

MAGNETIC-FLUX-COMPRESSION COOLING USING SUPERCONDUCTORS

DONALD M. STRAYER (Caltech), ULF E. ISRAELSSON (Caltech),
and DANIEL D. ELLEMAN (Caltech)

May 1989 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

NPO-17504 **Vol. 13, No. 5, P. 40**

Proposed magnetic-flux-compression refrigeration system produces final-stage temperatures below 4.2 K. More efficient than mechanical and sorption refrigerators at temperatures in this range. Weighs less than comparable liquid-helium-cooled superconducting magnetic refrigeration systems operating below 4.2 K. Magnetic-flux-compression cooling stage combines advantages of newly discovered superconductors with those of cooling by magnetization and demagnetization of paramagnetic salts.

B89-10222

STRAIN-LAYER-SUPERLATTICE LIGHT MODULATOR

JOSEPH MASERJIAN (Caltech)

May 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

NPO-16915 **Vol. 13, No. 5, P. 42**

Conceptual device combines resonant reflection and photovoltaic action to enable one light beam to impose spatial and temporal modulation on another light beam. Such spatial light modulator, with high speed and multiplicity of parallel signal channels, used in image processing or similar computation requiring high data-throughput rates. Microstructures of GaAs and InAs with multiple quantum wells and compositional superlattices grown by molecular-beam epitaxy. Enhanced electro-optical properties of arrangement of alternating layers enables writing light beam to modulate reading light beam.

B89-10223

APPARATUS MAKES PRECISELY SATURATED SOLUTIONS

MARC L. PUSEY

May 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-28280 **Vol. 13, No. 5, P. 42**

Simple laboratory apparatus establishes equilibrium conditions of temperature and concentration in solutions for use in precise measurements of saturation conditions. With equipment typical measurement of saturation concentration of protein in solution established and measured within about 24 hours. Precisely saturated solution made by passing solvent or solution slowly along column packed with solute at precisely controlled temperature. If necessary, flow stopped for experimentally determined interval to allow equilibrium to be established in column.

B89-10224

SYNTHETIC ESTIMATION FILTERS FOR DETERMINATION OF POSITION

RICHARD D. JUDAY, and STANLEY E. MONROE, JR. (Lockheed
Engineering and Management Services Co., Inc.)

May 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MSC-21418 **Vol. 13, No. 5, P. 44**

Concept of synthetic estimation filter (SEF) proposed to extend concept of matched filter from mere recognition of object to recognition of position and orientation relative to observing apparatus. Optical filter of this general type correlated with input image to obtain signal indicative of match between input and filter images.

B89-10225

HEATED RACK FOR WEATHERING TESTS

EDWARD F. CUDDIHY (Caltech), and PAUL B. WILLIS (Caltech)

May 1989 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

03 PHYSICAL SCIENCES

MD. 21240-0757

NPO-17524

Vol. 13, No. 5, P. 48

Outdoor photothermal aging reactor (OPTAR) simple device exposing polymer specimens to both heat and natural sunlight. Intended to provide accelerated aging data for service life of polymers used in outdoor environments. In principle, OPTAR accelerates (but does not initiate) degradation of polymers resulting from sunlight and other weathering effect (eg. rain, wind, ozone). Aging of tested material accelerated, but under almost-natural conditions.

B89-10226

ERROR-COMPENSATED TELESCOPE

ADEN B. MEINEL (Caltech), MARJORIE P. MEINEL (Caltech), and JOHN E. STACY (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16869

Vol. 13, No. 5, P. 48

Proposed reflecting telescope includes large, low-precision primary mirror stage and small, precise correcting mirror. Correcting mirror machined under computer control to compensate for error in primary mirror. Correcting mirror machined by diamond cutting tool. Computer analyzes interferometric measurements of primary mirror to determine shape of surface of correcting mirror needed to compensate for errors in wave front reflected from primary mirror and commands position and movement of cutting tool accordingly.

B89-10227

PHOTOVOLTAIC-DRIVEN MULTIPLE-QUANTUM-WELL MODULATOR

JOSEPH MASERJIAN (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16914

Vol. 13, No. 5, P. 51

Proposed high-performance spatial light modulator consists of multiple-quantum-well, strain-layer superlattice similar to one described in accompanying article, 'Strain-Layer-Superlattice Light Modulator' (NPO-16915). Device differs from other one, operates in transmission rather than in resonant reflection and therefore includes only one stack of GaAs/InAs layers having total thickness less than penetration depth (1 to 2 micrometer) of optical modulating signal. Alternating, semitransparent semiconductor layers contain space-charge barriers forming quantum wells. Modulating light (with photon energy greater than semiconductor band gap) induces photovoltaic action, which affects transmission of modulated light (having photon energy less than band gap).

B89-10228

HIGH-ALTITUDE TURBULENCE FOR SUPERSONIC AIRPLANES

L. J. EHERNBERGER (Dryden Flight Research Facility)

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23100)

ARC-12149

Vol. 13, No. 5, P. 52

Report reviews accumulated knowledge of atmospheric turbulence at high altitudes. Discusses characteristics of high-altitude turbulence and associated meteorological features, with emphasis on data obtained by flight research conducted in XB-70 and YF-12A prototype aircraft. Gives example of numerical simulation of gravity waves to illustrate potential contribution of such studies to understanding of atmospheric turbulence. Products of such efforts include ability to extend estimates of transient properties of atmospheric altitudes below 20 km to altitudes as high as 80 km for use in design and flight simulation of future advanced aerospace vehicles. Enables more accurate assessment of feasibility of remote sensors and computer systems aboard

airplanes to process measurements into advanced warnings of turbulence.

B89-10229

RESEARCH IN MICROGRAVITY ON EARTH

BRUCE N. ROSENTHAL, THOMAS K. GLASGOW, DANIEL D. ELLEMAN (Caltech), and RICHARD E. BLACK (Marshall Space Flight Center)

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16917)

LEW-14660

Vol. 13, No. 5, P. 53

Report surveys ground-based facilities for research in microgravity. Facilities fall into three categories: Those providing true microgravity environment for short time, such as rockets, airplanes, drop towers, and drop tubes; those emulating one or more aspects of microgravity environment, such as electromagnetic or acoustic levitators; and those aiding in understanding behavior of systems in microgravity, such as model furnaces and computational facilities. Concentrates on material-processing facilities of NASA at Lewis Research Center, Marshall Space Flight Center, and Jet Propulsion Laboratory. Describes facilities briefly, provides names, and telephone numbers for further information and arranges for qualified researchers to use facilities.

B89-10286

STANDARD METHOD FOR RADIATION TESTS OF LIQUIDS

FRANK L. BOUQUET (Caltech), and ROBERT B. SOMOANO (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16840

Vol. 13, No. 6, P. 48

Simple procedure provides standard method for radiation tests of liquids. Assures identical handling and dosage so data from different test laboratories compared reliably. Pair of glass vials, joined by frangible neck and equipped with valves, used. Third vial also used. Filled with control specimen and not irradiated. Developed for measuring properties of liquids for use in radiation-resistant liquid-dielectric capacitors, procedure used for any of variety of liquids proposed for use in high-radiation environment - in x-ray and particle-accelerating machines and nuclear reactors, for example.

B89-10287

LONG-WAVELENGTH INFRARED DETECTOR

RICHARD P. VASQUEZ (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17543

Vol. 13, No. 6, P. 48

Proposed device detects infrared photons of 10- to 100-micrometer wavelength by intersubband absorption in coupled quantum wells. Based on splitting of energy level occurring when two quantum wells placed so close together wave functions of quantized energy levels overlap. Detector absorbs photons, energy which equals difference in energy between two levels resulting from split. Because degree of overlap of wave functions and, therefore, magnitude of split varied by varying width of barrier between two coupled wells, such detector, in principle, designed to operate at any desired wavelength. Restrictions on design parameters of quantum wells of proposed device less severe than single-well devices. Energy levels near tops of wells still necessary so photoexcited carriers tunnel out. Additional flexibility in design obtained by use of wells formed by barriers of different heights.

B89-10288

THERMAL ANALYSIS OF RELUCTANT GLASS FORMERS

EDWIN C. ETHRIDGE, and PETER A. CURRERI

Jun. 1989 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28283

Vol. 13, No. 6, P. 50

Thermocouple holds sample and monitors temperature during cooling. Ellipsoidal furnace provides controlled cooling rates for studies of thermal properties of reluctant glass formers. Glass tube inserted into furnace and used to blow helium on specimen to cool rapidly. Cooling curve analyzed to determine rate of cooling and such properties of sample as nucleation and recalescence temperatures at cooling rate. Continuous-cooling-crystallization boundaries determined empirically from plots of nucleation time vs. nucleation temperature from runs at large number of different rates of cooling. Apparatus used to examine glass-formation ability of material and critical cooling rate to form glass.

B89-10289

DYNAMIC-RANGE COMPRESSION FOR INFRARED IMAGERY

LI-JEN CHENG (Caltech), and HUA-KUANG LIU (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17140

Vol. 13, No. 6, P. 54

Photorefractive crystals covering detectors prevent saturation. To make full use of information in image, desirable to compress dynamic range of input intensity to within region of approximately linear response of detector. Dynamic-range compression exhibited by measurements of attenuation in photorefractive GaAs. Effective dynamic-range-compressor plate, film, or coating reduces apparent contrast of scene imaged on detector plane to within dynamic range of detectors; original image contrast or intensity data recovered subsequently in electronic image processing because range-compression function and inverse known.

B89-10290

MAKING DURABLE SPECIMENS FOR ELECTRON MICROSCOPY

JOSEPH DOYCHAK (Sverdrup Technology, Inc.)

Jun. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14755

Vol. 13, No. 6, P. 55

Consistent metal-oxide cross sections prepared quickly. New process makes TEM/STEM cross sections of metal/oxide interfaces. After specimen bars oxidized, placed in specially designed mold. Following encapsulation in zinc alloy, 3-mm-diameter specimen bar sliced into disks suitable for further preparation steps. Technique used to prepare 3-mm-diameter specimens of cross sections of oxides of alloys intended for use at temperatures greater than approximately 600 degree C.

B89-10291

ISOTHERMAL EQUATION OF STATE FOR COMPRESSED SOLIDS

PASCAL VINET, and JOHN FERRANTE

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-28775)

LEW-14615

Vol. 13, No. 6, P. 55

Same equation with three adjustable parameters applies to different materials. Improved equation of state describes pressure on solid as function of relative volume at constant temperature. Even though types of interatomic interactions differ from one substance to another, form of equation determined primarily by overlap of electron wave functions during compression. Consequently, equation universal in sense it applies to variety of substances, including ionic, metallic, covalent, and rare-gas solids. Only three parameters needed to describe equation for given material.

B89-10292

EQUATION OF STATE WITH TEMPERATURE EFFECTS FOR SOLIDS

PASCAL VINET, JOHN FERRANTE, JOHN R. SMITH (General Motors Corp.), and JAMES H. ROSE (Department of Energy)

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-28776)

LEW-14616

Vol. 13, No. 6, P. 56

Behavior at high temperature predicted from only four parameters. Equations derived to express thermodynamical properties of compressed solids at high temperatures. New equations based on fundamental considerations of thermodynamics, isothermal equation of state, and assumption thermal pressure independent of volume and varies linearly with temperature near and about Debye temperature. Using only four parameters (three are those of isothermal equation of state), new equations describe thermodynamic behavior of material over range of temperatures from approximately Debye temperature to melting point.

B89-10293

MEASURING TRANSMISSION EFFICIENCIES OF MASS SPECTROMETERS

SANTOSH K. SRIVASTAVA (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16989

Vol. 13, No. 6, P. 58

Coincidence counts yield absolute efficiencies. System measures mass-dependent transmission efficiencies of mass spectrometers, using coincidence-counting techniques reminiscent of those used for many years in calibration of detectors for subatomic particles. Coincidences between detected ions and electrons producing them counted during operation of mass spectrometer. Under certain assumptions regarding inelastic scattering of electrons, electron/ion-coincidence count is direct measure of transmission efficiency of spectrometer. When fully developed, system compact, portable, and used routinely to calibrate mass spectrometers.

B89-10294

AUTOMATED HEAT-FLUX-CALIBRATION FACILITY

CURT H. LIEBERT, and DONALD H. WEIKLE

Jun. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14724

Vol. 13, No. 6, P. 59

Computer control speeds operation of equipment and processing of measurements. New heat-flux-calibration facility developed at Lewis Research Center. Used for fast-transient heat-transfer testing, durability testing, and calibration of heat-flux gauges. Calibrations performed at constant or transient heat fluxes ranging from 1 to 6 MW/m² and at temperatures ranging from 80 K to melting temperatures of most materials. Facility developed because there is need to build and calibrate very-small heat-flux gauges for Space Shuttle main engine (SSME). Includes lamp head attached to side of service module, an argon-gas-recirculation module, reflector, heat exchanger, and high-speed positioning system. This type of automated heat-flux calibration facility installed in industrial plants for onsite calibration of heat-flux gauges measuring fluxes of heat in advanced gas-turbine and rocket engines.

B89-10295

ACCURACY OF HOT-WIRE ANEMOMETRY IN SUPERSONIC TURBULENCE

PAMELA LOGAN, ROBERT L. MCKENZIE, and DANIEL BERSHADER

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11802**Vol. 13, No. 6, P. 60**

Sensitivity of hot-wire probe compared to laser-induced-fluorescence measurements. Report discusses factors affecting readings of hot-wire anemometer in turbulent supersonic boundary layer. Presents theoretical analysis of responses of hot-wire probe to changes in flow; also compares measurements by hot-wire probe with measurements of same flows by laser-induced fluorescence (LIF). Because LIF provides spatially and temporally resolved data on temperature, density, and pressure, provides independent means to determine responses of hot-wire anemometers to these quantities.

B89-10296**COMPUTING GEOPOTENTIAL PERTURBATIONS**

VICTOR R. BOND (McDonnell-Douglas Corp.), and DAVID D. MULCIHY (McDonnell-Douglas Corp.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21281**Vol. 13, No. 6, P. 61**

Improved formulation reduces error and number of computational steps. Report describes method for calculating partial derivative of geopotential perturbation with respect to time. Useful in computations of orbit of lightweight satellite in which total orbital energy or related parameter one of dependent variables.

B89-10302**DESIGNING CORRECTOR OPTICS**

A. DANTZLER

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13120**Vol. 13, No. 6, P. 70**

Image-spot radii reduced by factors ranging from 5 to 25. Corrector Surface Design Software (CORFIG) calculates optimum figure of corrector surface for optical system based on real ray traces. Generates corrector figure in form of spline data-point table and/or list of polynomial coefficients. Number of spline data points as well as number of coefficients specified by user. Optimizes figure of corrector surface for on-axis images at single wavelength only. CORFIG also significantly improves quality of field images and images formed at wavelengths other than design wavelength. Written completely in VAX FORTRAN.

B89-10353**REDUCING HEATING IN HIGH-SPEED CINEMATOGRAPHY**

HOWARD A. SLATER

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-11100)

LEW-14798**Vol. 13, No. 7, P. 44**

Infrared-absorbing and infrared-reflecting glass filters simple and effective means for reducing rise in temperature during high-speed motion-picture photography. 'Hot-mirror' and 'cold-mirror' configurations, employed in projection of images, helps prevent excessive heating of scenes by powerful lamps used in high-speed photography.

B89-10354**FOUR-MODE SQUEEZING FOR OPTICAL COMMUNICATIONS**

BONNY L. SCHUMAKER (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17170**Vol. 13, No. 7, P. 44**

Experiments demonstrated potential of four-mode squeezing for increasing immunity to noise in fiber-optical communication systems and interferometric devices. Four-mode squeezing reduces

quantum noise more than ordinary squeezing and provides partial immunity to non-quantum-mechanical phase noise arising in such media as optical fibers.

B89-10355**SPATIAL MODULATION OF LIGHT IN GAAS**

LI-JEN CHENG (Caltech), GREGORY GHEEN (Caltech), and AFSHIN PARTOVI (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17228**Vol. 13, No. 7, P. 46**

Spatial modulation of light in gallium arsenide demonstrated by transferring image from one of two coherent, crossing beams of light to other one. Technique relies on cross-polarization beam coupling, product of photorefractive effect in GaAs crystal.

B89-10356**HEAT-FLUX SENSOR FOR HOT ENGINE CYLINDERS**

WALTER S. KIM, RICHARD F. BARROWS, FLOYD A. SMITH, and JOHN KOCH

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-18892)

LEW-14830**Vol. 13, No. 7, P. 48**

Heat-flux sensor includes buried wire thermocouple and thin-film surface thermocouple, made of platinum and platinum with 13 percent rhodium. Sensor intended for use in ceramic-insulated, low-heat-rejection diesel engine at temperatures of about 1,000 K. Thermocouple junction resists environment in cylinder of advanced high-temperature diesel engine created by depositing overlapping films of Pt and 0.87 Pt/0.13 Rh on iron plug. Plug also contains internal thermocouple.

B89-10357**ACHROMATICAL OPTICAL CORRELATOR**

TIEN-HSIN CHAO (Caltech), and HUA-KUANG LIU (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17206**Vol. 13, No. 7, P. 49**

Signal-to-noise ratio exceeds that of monochromatic correlator. Achromatical optical correlator uses multiple-pinhole diffraction of dispersed white light to form superposed multiple correlations of input and reference images in output plane. Set of matched spatial filters made by multiple-exposure holographic process, each exposure using suitably-scaled input image and suitable angle of reference beam. Recording-aperture mask translated to appropriate horizontal position for each exposure. Noncoherent illumination suitable for applications involving recognition of color and determination of scale. When fully developed achromatical correlators will be useful for recognition of patterns; for example, in industrial inspection and search for selected features in aerial photographs.

B89-10358**BOUNDARY-VALUE PROBLEM FOR MAGNETIC-CUTOFF RIGIDITIES**

LARRY D. EDMONDS (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17294**Vol. 13, No. 7, P. 50**

Field equations yield overview of motions of many charged particles. Alternative approach developed for calculation of magnetic cutoff rigidities of electrically-charged particles in static magnetic field. New formulation involves partial differential field equation treated as boundary-value problem. Tracing of trajectories needed only to supply boundary conditions.

B89-10359**FAST LASER HOLOGRAPHIC INTERFEROMETRY FOR WIND TUNNELS**

GEORGE LEE

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11840**Vol. 13, No. 7, P. 51**

Proposed system makes holographic interferograms quickly in wind tunnels. Holograms reveal two-dimensional flows around airfoils and provide information on distributions of pressure, structures of wake and boundary layers, and density contours of flow fields. Holograms form quickly in thermoplastic plates in wind tunnel. Plates rigid and left in place so neither vibrations nor photographic-development process degrades accuracy of holograms. System processes and analyzes images quickly. Semiautomatic micro-computer-based desktop image-processing unit now undergoing development moves easily to wind tunnel, and its speed and memory adequate for flows about airfoils.

B89-10360**CALCULATING RESPONSE OF A TUNABLE-DIODE-LASER SPECTROMETER**

RANDY D. MAY (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17375**Vol. 13, No. 7, P. 52**

Response function calculated from measurements by iterative deconvolution procedure. Report describes measurements made with tunable-diode-laser spectrometer and processing of measurement data to calculate response function. Procedure fast and simple enough to be used to make routine corrections for broadening in diode-laser spectrometers.

B89-10361**RESEARCH IN THERMOELECTRIC MATERIALS**

CHARLES WOOD (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17403**Vol. 13, No. 7, P. 54**

Report reviews current research in thermoelectric materials with view towards development of materials of greater energy-conversion efficiency. Emphasis on effort to understand and manipulate microstructure to increase thermoelectric figure of merit, Z. Thermoelectric properties of three broad categories of materials discussed. First category includes alloys of group IV elements like silicon and germanium. Second category is rare-earth chalcogenides. Third category includes narrow-band semiconductors, especially boron carbides.

B89-10399**OPTICAL PROCESSING WITH PHOTOREFRACTIVE SEMICONDUCTORS**

LI-JEN CHENG (Caltech), and GREGORY GHEEN (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17324**Vol. 13, No. 8, P. 37**

Experimental phase-conjugate four-wave-mixing apparatus used to demonstrate capabilities of GaAs (and potentially of other photorefractive semiconductors like InP and CdTe) for optical processing of information. With modifications, performs any of three basic image-processing functions: transfer to different light beam, enhancement of edges, and autocorrelation. Includes crystal of GaAs of 5 by 9 by 9 mm with cubic crystalline axes. Advantages include high speed and compatibility with other semiconductor devices.

B89-10400**CHOOSING COMPOSITIONS OF ELECTROCATALYSTS**

DANIEL D. LAWSON (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17167**Vol. 13, No. 8, P. 38**

Simple theory predicts compositions of alloys that exhibit maximum catalytic activities in presence of certain reactants. Method used to select best catalysts for electrochemical batteries and fuel cells. Oxygen-electrode overvoltage plotted against solubility parameter of lead/platinum electrode in acidic and basic solutions. Electrode formed by plating mixtures of lead and platinum, corresponding to various solubility parameters. Method based on one used to analyze activities of nonelectrical catalysts in reactions involving hydrogen or oxygen. Rate of such reaction increases when solubility parameter of catalyst matches reactant.

B89-10401**ALGORITHM ESTIMATES MICROWAVE WATER-VAPOR DELAY**

STEVEN E. ROBINSON (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17267**Vol. 13, No. 8, P. 38**

Accuracy equals or exceeds conventional linear algorithms. 'Profile' algorithm improved algorithm using water-vapor-radiometer data to produce estimates of microwave delays caused by water vapor in troposphere. Does not require site-specific and weather-dependent empirical parameters other than standard meteorological data, latitude, and altitude for use in conjunction with published standard atmospheric data. Basic premise of profile algorithm, wet-path delay approximated closely by solution to simplified version of nonlinear delay problem and generated numerically from each radiometer observation and simultaneous meteorological data.

B89-10402**OPTICAL INTERFEROMETRIC MICROMETROLOGY**

PHILLIP B. ABEL, and JAMES R. LAUER (Rensselaer Polytechnic Inst.)

Aug. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-23196)

LEW-14837**Vol. 13, No. 8, P. 40**

Resolutions in angstrom and subangstrom range sought for atomic-scale surface probes. Experimental optical micrometrological system built to demonstrate calibration of piezoelectric transducer to displacement sensitivity of few angstroms. Objective to develop relatively simple system producing and measuring translation, across surface of specimen, of stylus in atomic-force or scanning tunneling microscope. Laser interferometer used to calibrate piezoelectric transducer used in atomic-force microscope. Electronic portion of calibration system made of commercially available components.

B89-10403**HOLLOW-CATHODE SOURCE GENERATES PLASMA**

W. D. DEININGER (Caltech), G. ASTON (Caltech), and L. C. PLESS (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16992**Vol. 13, No. 8, P. 44**

Device generates argon, krypton, or xenon plasma via thermionic emission and electrical discharge within hollow cathode and ejects plasma into surrounding vacuum. Goes from cold start up to full operation in less than 5 s after initial application of power. Exposed to moist air between operations without significant degradation of starting and running characteristics. Plasma

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generated by electrical discharge in cathode barrel sustained and aided by thermionic emission from emitter tube. Emitter tube does not depend on rare-earth oxides, making it vulnerable to contamination by exposure to atmosphere. Device modified for use as source of plasma in laboratory experiments or industrial processes.

B89-10404

DIODE-LASER DOPPLER VELOCIMETER

GREGORY J. GETZER (OPHIR Corp.)

Aug. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-26104

Vol. 13, No. 8, P. 44

Diode-laser Doppler velocimeter measures nonintrusively flow of incompressible fluid in narrow tube. New velocimeter rugged, compact, and competitive in cost. Includes three-section optical head mounted on tube containing flow. In slightly different version, beam splitter and mirror used to split laser beam into two beams.

B89-10405

ETALONS HELP SELECT MODES OF LASER DIODES

WILLIAM L. MAYNARD

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13235

Vol. 13, No. 8, P. 46

Stability under changes of temperature and current increased. External etalon aligned with laser diode provides optical feedback enhancing stability of operation in one or few of longitudinal laser modes. Provides amount of feedback varying periodically with wavelength. Also helps to increase stability by reducing sensitivity to minor feedback from external objects other than etalon.

B89-10406

LASER RAYLEIGH-SCATTERING DURING SPACE SHUTTLE ENTRY

ROBERT L. MCKENZIE

Aug. 1989 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A87-43052)

ARC-11841

Vol. 13, No. 8, P. 48

Report presents detailed study of capabilities and requirements for equipment of proposed ultraviolet Rayleigh-scattering instrument to be carried aboard Space Shuttle. Density of atmosphere around flightpath measured. With accuracy and resolution, measurements adequate for detection of small-scale meteorological structure affecting analysis of flight dynamic data of reentering spacecraft. Also discusses extensions of concept to measurements of location of, and density as function of position in, shock wave of Space Shuttle. Measurements provide baseline data for verification of computer models of high-enthalpy hypersonic, nonequilibrium, and viscous conditions.

B89-10440

OPTICAL MEASUREMENT OF SOUND PRESSURE

EUGENE H. TRINH (Caltech), MARK GASPARD (Caltech), and EMILY W. LEUNG (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17565

Vol. 13, No. 9, P. 50

Noninvasive technique does not disturb field it measures. Sound field deflects laser beam proportionally to its amplitude. Knife edge intercepts undeflected beam, allowing only deflected beam to reach photodetector. Apparatus calibrated by comparing output of photodetector with that of microphone. Optical technique valuable where necessary to measure in remote, inaccessible, or hostile environment or to avoid perturbation of measured region.

B89-10441

ESR MEASUREMENT OF CRYSTALLINITY IN SEMICRYSTALLINE POLYMERS

SOON SAM KIM (Caltech), and FUN-DOW TSAY (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17369

Vol. 13, No. 9, P. 50

Photogenerated free radicals decay at different rates in crystalline and amorphous phases. Degree of crystallinity in polymer having both crystalline and amorphous phases measured indirectly by technique based in part on electron-spin-resonance (ESR) spectroscopy. Accuracy of crystallinity determined by new technique equals or exceeds similar determinations by differential scanning calorimetry, wide-angle x-ray scattering, or measurement of density.

B89-10442

SPECKLE-SUPPRESSION APPARATUS

ISRAEL TABACK (Bionetics Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13771

Vol. 13, No. 9, P. 54

Technique and apparatus developed to reduce speckle in unmodulated laser pulses, using reduced number of optical fibers. Expected to decrease costs of bundles of optical fibers used to transmit unmodulated laser pulses. New apparatus reduces speckle in optically transmitted, unmodulated laser input pulse by introducing number of independent delays into pulse.

B89-10443

PROBE SAMPLES AND COOLS HOT GAS

DONALD F. SCHULTZ

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14856

Vol. 13, No. 9, P. 56

Simple concentric-tube gas-sampling probe, developed to sample hot gas streams. Includes straight outer tube and inner tube, bent to be concentric to outer tube at one end and tangent to outer tube in sampling region at other end. Two tubes brazed together along sampling region and at end to prevent sampled gas and cooling stream from mixing. Inner tube contains sampled gas, and space outside inner tube but inside outer tube path for cooling stream.

B89-10444

SEPARATING ISOTOPES WITH LASER AND ELECTRON BEAMS

SANDOR TRAJMAR (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16907

Vol. 13, No. 9, P. 58

Need for second laser eliminated. In scheme for separation of isotopes, electrons of suitable kinetic energy ionize specific isotope excited by laser beam in magnetic field. Ionization by electron beams cheap and efficient in comparison to ionization by laser beams, and requires no special technical developments. Feasibility of new scheme demonstrated in selective ionization of Ba138, making possible separation of isotope from Ba isotopes of atomic weight 130, 132, 134, 135, 136, and 137.

B89-10445

TUNNEL-EFFECT DISPLACEMENT SENSOR

WILLIAM J. KAISER (Caltech), and STEVEN B. WALTMAN (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17362

Vol. 13, No. 9, P. 59

Tunnel position sensor simple device measuring small displacements or accelerations. Used to make compact, sensitive accelerometers or strain gauges or to measure impacts of particles. Variation in distance between two electrodes measured via variation in tunneling current between them. Tunnel microsensors provide versatility for application as accelerometers, force sensors, strain sensors, particle detectors, and other devices for space applications.

B89-10446

EYE-SAFE LIDAR

ROBERT L. BYER (Stanford Univ.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17464

Vol. 13, No. 9, P. 60

Laser infrared radar (lidar) undergoing development harmless to human eyes, consists almost entirely of solid-state components, and offers high range resolution. Operates at wavelength of about 2 micrometers. If radiation from such device strikes eye, almost completely absorbed by cornea without causing damage, even if aimed directly at eye. Continuous-wave light from laser oscillator amplified and modulated for transmission from telescope. Small portion of output of oscillator fed to single-mode fiber coupler, where mixed with return pulses. Intended for remote Doppler measurements of winds and differential-absorption measurements of concentrations of gases in atmosphere.

B89-10447

MAKING EXCITED OXYGEN MOLECULES AND ATOMS

RICHARD P. VASQUEZ (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17534

Vol. 13, No. 9, P. 61

Oxidation of semiconductors and high-temperature superconductors achieved at lower temperatures by use of oxygen molecules or atoms raised into specific excited states. Use of excited oxygen (or other species) of interest in research on kinetics and mechanisms of chemical reactions. Used in ultra-high-vacuum chamber also equipped for such surface-analytical techniques as x-ray photoelectron spectroscopy.

B89-10448

UNPRESSURIZED CONTAINER FOR CRYOGENIC TESTING

SUSAN B. WALKER (United Technologies, Corp.)

Sep. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28347

Vol. 13, No. 9, P. 62

Unpressurized cryostat makes mechanical testing of materials at low temperature more convenient. Maintains specimens at temperatures of -400 to -450 degree F without sealing them in gastight, vacuum-insulated container. Easy to insert and remove specimens and attach instrumentation wiring to them. Vents vapor continuously, so no danger of buildup of internal pressure from evaporating cryogenic liquid. Includes two concentric chambers with stainless-steel walls and fiber insulation. Specimen mounted in inner chamber, and such instruments as extensometers and thermocouples attached. Loose lid of polystyrene foam or other suitable material placed over vessel.

B89-10449

CONVERGENT-FILAMENT NONMECHANICAL PUMP

EARL R. COLLINS, JR. (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17301

Vol. 13, No. 9, P. 64

Simple device induces small flow of liquid without help of moving parts, in presence or absence of gravity. Drops of liquid move on filaments from wide end of cone to narrow end. Gradually blend with drops on adjacent filaments to form large drops with menisci. Important use expected to be returning liquid condensate in heat pipes, and collection of samples from clouds or fog.

B89-10450

POLYMERIC ELECTROLYTIC HYGROMETER FOR HARSH ENVIRONMENTS

DANIEL D. LAWSON (Caltech), PARTHASARATHY SHAKKOTTAI (Caltech), and SHAKKOTTAI P. VENKATESHAN (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17365

Vol. 13, No. 9, P. 66

Design of polymeric electrolytic hygrometer improved to meet need for reliable measurements of relative humidity in harsh environments of pulpmills and papermills. Redesign sensor head features shorter, more-rigidly-held sensing element, less vulnerable than previous version to swell and loss of electrical contact. Useful for control of batch dryers in food and pharmaceutical industries.

B89-10451

HIGH-RESOLUTION, TWO-WAVELENGTH PYROMETER

DONALD B. BICKLER (Caltech), PAUL K. HENRY (Caltech), and D. DANIEL LOGIURATO (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17287

Vol. 13, No. 9, P. 68

Modified two-color pyrometer measures temperatures of objects with high spatial resolution. Image focused on hole 0.002 in. (0.05 mm) in diameter in brass sheet near end of bundle, causing image to be distributed so fibers covered by defocused radiation from target. Pinhole ensures radiation from only small part of target scene reaches detector, thus providing required spatial resolution. By spreading radiation over bundle, pinhole ensures entire active area of detectors utilized. Produces signal as quiet as conventional instruments but with only 1/64 input radiation.

B89-10452

HYDRODYNAMIC STABILITY AND FRAMES OF REFERENCE

MICHAEL A. ZAK (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17740

Vol. 13, No. 9, P. 71

Criteria of stability different in different sets of coordinates. Report discusses dependence of criteria of hydrodynamic instability upon frame of reference used to analyze motion of fluid.

B89-10453

TEMPERATURE DEPENDENCE OF ELASTIC CONSTANTS OF POLYMERS

ROBERT SIMHA (Case Western Reserve Univ.), and ELISABETH PAPAZOGLOU (Case Western Reserve Univ.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17762

Vol. 13, No. 9, P. 71

Two papers extend theory of elastic constants of disordered solids to finite temperatures below glass-transition temperatures. First paper, entitled 'Elastic Constants of Disordered Solids II:

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Temperature Dependence,' applies to cryogenic temperatures. Second paper, entitled 'Theory of Thermoelastic Properties for Polymer Glasses,' develops unified treatment for static compressional and elongational properties at temperatures up to glass-transition temperatures.

B89-10503

CRYOGENIC SHUTTER MECHANISM

RICHARD D. BARNEY, and THOMAS J. MAGNER

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13189

Vol. 13, No. 10, P. 39

Electromagnetic shutter mechanism operates at ambient and cryogenic temperatures to shield optical element, such as mirror, filter, polarizer, beam splitter, or detector, from external light and radiation in cryogenic Dewar equipped with window for optical evaluation. Shutter mechanism in Dewar container alternately shields and exposes optical element as paddle rotates between mechanical stops. Mounted on cold plate of liquid-helium reservoir. Paddle, shaft, and magnet constitutes assembly rotated by electromagnetic field on coil.

B89-10504

SUBMINIATURE HOT-WIRE PROBES

R. V. WESTPHAL, F. R. LEMOS, and P. M. LIGRANI (Naval Postgraduate School)

Oct. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-22336)

ARC-12228

Vol. 13, No. 10, P. 40

Class of improved subminiature hot-wire flow-measuring probes developed. Smaller sizes yield improved resolution in measurements of practical aerodynamic flows. Probe made in one-wire, two-perpendicular-wire, and three-perpendicular-wire version for measurement of one, two, or all three components of flow. Oriented and positioned on micromanipulator stage and viewed under microscope during fabrication. Tested by taking measurements in constant-pressure turbulent boundary layer. New probes give improved measurements of turbulence quantities near surfaces and anisotropies of flows strongly influence relative errors caused by phenomena related to spatial resolution.

B89-10505

MAKING A CIRCULAR-HARMONIC FILTER

YEOU YEN CHENG (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17263

Vol. 13, No. 10, P. 41

Optical image-correlating system made rotationally invariant. Experiment shows circular-harmonic filter generated optically. Hologram made by phase-shifted-double-exposure procedure. Filter used in optical image-recognition system based on correlation between target (image to be recognized) and matched spatial filter. In addition to usual invariance under translation of target, circular harmonic filter invariant under rotation of target; peak intensity of illumination at origin of correlation plane does not vary when target rotated about optical axis.

B89-10506

PROTECTING FUEL CELLS FROM DROWNING

GEORGE T. SULJAK (United Technologies Corp.), and NUNZIATO J. MAIO (United Technologies Corp.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21477

Vol. 13, No. 10, P. 44

Water in fuel cell extracted before it reaches cells. Stack of

fuel cells gets supply of hydrogen from manifold. Heat-exchanger plate and reservoir collect water from flow of hydrogen. Water in reservoir evaporated with heat from coolant heat-exchanger plate.

B89-10507

TURBULENCE AND EVAPORATION IN CLUSTERS OF DROPS

JOSETTE BELLAN (Caltech), and KENNETH G. HARSTAD (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17323

Vol. 13, No. 10, P. 45

Report presents theoretical model of evaporation of cluster of drops of single-component liquid fuel in and of processes of exchange between cluster and gas surrounding it. Formulation of model has three components: description of conservation of mass, molecular species, and enthalpy in sphere of influence of each drop; description of conservation of mass, molecular species, and enthalpy in cluster volume; description of convective effects by use of differential equations expressing conservation of momentum for gases and drops. Results obtained from analysis show turbulence enhances evaporation and controlling factor in evaporation of very dense clusters. Practical implication of findings evaporation of fuel controlled more readily near fuel injector than farther along combustor.

B89-10508

EFFECTS OF TURBULENCE ON IGNITION

JOSETTE BELLAN (Caltech), and KENNETH G. HARSTAD (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17335

Vol. 13, No. 10, P. 46

Report presents theoretical study of effects of turbulence on ignition of drops of single-component liquid fuel. Closely related to article, 'Turbulence and Evaporation in Clusters of Drops' (NPO-17323). Uses theoretical model for evaporation and model for ignition developed previously. Radial velocity, v_a , of gas at surface of sphere of influence taken as algebraic combination of rate of evaporation and speed with which radius changes. Weighting factors of algebraic combination are such that in dilute spray, all new vapor coming from drops trapped in cluster, whereas in dense spray where evaporation strong, maximum new vapor escapes to ambient.

B89-10509

MODEL OF TURBULENT GAS EDDIES CONTAINING DROPS

JOSETTE BELLAN (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17336

Vol. 13, No. 10, P. 46

Report proposes development of mathematical model of turbulent eddy of gas containing drops of liquid fuel. Closely related to those described in 'Turbulence and Evaporation in Clusters of Drops' (NPO-17323) and 'Effects of Turbulence on Ignition' (NPO-17335). Goal to initiate development of theory of interactions of several eddies containing drops during evaporation, ignition, and combustion of liquid fuels injected into combustors. Numerical results of analysis given as plot of nondimensionalized evaporation time versus initial ratio of air mass to fuel mass.

B89-10510

AIMING INSTRUMENTS ON THE SPACE STATION

JAY M. ESTUS (Caltech), ROBERT LASKIN (Caltech), and YU-HWAN LIN (Caltech)

Oct. 1989 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17518

Vol. 13, No. 10, P. 46

Report discusses capabilities and requirements for aiming scientific instruments carried aboard proposed Space Station. Addresses two issues: whether system envisioned for pointing instruments at celestial targets offers sufficiently low jitter, high accuracy, and high stability to meet scientific requirements; whether it can do so even in presence of many vibrations and other disturbances on Space Station. Salient conclusion of study, recommendation to develop pointing-actuator system including mechanical/fluid base isolator underneath reactionless gimbal subsystem. This kind of system offers greatest promise of high performance, cost-effectiveness, and modularity for job at hand.

B89-10513

TRACING RAYS IN A SOLAR POWER SYSTEM

KENT JEFFERIES, and CHRIS GALLO (W. L. Tanksley and Associates)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14778

Vol. 13, No. 10, P. 53

OFFSET is ray-tracing computer code for analysis of optics of solar collector. Code models distributions of solar flux within receiver cavity, produced by reflections from collector. Developed to model mathematically offset solar collector of solar dynamic electric power system being developed for Space Station Freedom. Used to develop revised collector-facet concept of four groups of toroidally contoured facets. Also used to develop methods for tailoring distribution of flux incident on receiver. Written in FORTRAN 77 (100 percent).

B89-10514

SIMULATING SCENES IN OUTER SPACE

JOHN D. CALLAHAN (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17246

Vol. 13, No. 10, P. 54

Multimission Interactive Picture Planner, MIP, computer program for scientifically accurate and fast, three-dimensional animation of scenes in deep space. Versatile, reasonably comprehensive, and portable, and runs on microcomputers. New techniques developed to perform rapidly calculations and transformations necessary to animate scenes in scientifically accurate three-dimensional space. Written in FORTRAN 77 code. Primarily designed to handle Voyager, Galileo, and Space Telescope. Adapted to handle other missions.

B89-10515

GAUSSIAN-BEAM LASER-RESONATOR PROGRAM

PATRICIA L. CROSS, CLAYTON H. BAIR, and NORMAN BARNES

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14080

Vol. 13, No. 10, P. 54

Gaussian Beam Laser Resonator Program models laser resonators by use of Gaussian-beam-propagation techniques. Used to determine radii of beams as functions of position in laser resonators. Algorithm used in program has three major components. First, ray-transfer matrix for laser resonator must be calculated. Next, initial parameters of beam calculated. Finally, propagation of beam through optical elements computed. Written in Microsoft FORTRAN (Version 4.01).

B89-10553

ALL-OPTICAL PHOTOCHROMIC SPATIAL LIGHT MODULATORS

DAVID N. BERATAN (Caltech), and JOSEPH W. PERRY (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17612

Vol. 13, No. 11, P. 44

Photochemical transfer of electrons enables fast reading and writing. New concept based on transfer of electrons between donor and acceptor molecules randomly distributed or covalently linked and dispersed in glassy-polymer host material. Transfer causes significant changes in optical-transmission characteristics of material and used to modulate transmission of reading beam of light impinging on material.

B89-10554

VERY-LONG-BASELINE INTERFEROMETRY USING CHEAP SATELLITES

M. J. MAHONEY (Caltech), D. L. JONES (Caltech), T. B. H. KUIPER (Caltech), and R. A. PRESTON (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17488

Vol. 13, No. 11, P. 44

Celestial radiation below 25 MHz, heretofore inaccessible, yields new insights. Report discusses feasibility of array of small satellites deployed in high orbit around Earth to monitor celestial radio sources at frequencies less than 25 MHz. Objective to make high-angular-resolution map of such sources over entire sky by use of very-long-baseline interferometry (VLBI).

B89-10555

GRAVITATION- AND CONDUCTION-DRIVEN MELTING IN A SPHERE

PARVIZ A. BAHRAMI (Caltech), and TAYLOR G. WANG (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16758

Vol. 13, No. 11, P. 45

Simplifying assumptions lead to approximate closed-form solution. Theoretical paper discusses melting of solid sphere in spherical container. Develops mathematical model of melting process, based in part on simplifying assumptions like those used in theories of lubrication and film condensation. Resulting equation for melting speed as function of melting distance solved approximately in closed form.

B89-10556

MORE ON SCATTERING FROM DIRTY MIRRORS

YAUJEN WANG (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17490

Vol. 13, No. 11, P. 46

Mathematical model of scattering expanded from visible to include infrared wavelengths. Paper describes extension of mathematical model of scattering from mirror slightly contaminated with particulates. Original version of model applies to scattering at visible wavelengths. Updated version used to predict scattering at wavelengths from visible through infrared, based on measurements in visible spectrum.

B89-10557

MULTIPLE-VORTEX-RING MODEL OF A MICROBURST

THOMAS A. SCHULTZ

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Nov. 1989 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A88-22511)

ARC-12219 Vol. 13, No. 11, P. 47

Data from wind-shear incident support two-ring model. Report discusses multiple-vortex-ring mathematical model of microburst, which is strong downdraft that induces outflow of strong winds near ground. This low-altitude wind-shear phenomenon is topic of continuing study because of its effect on safety of flight.

B89-10560

REMOVING HIDDEN LINES FOR THERMAL ANALYSIS

R. RIVERA (Rockwell International Corp.), and T. M. JOHNSON (Rockwell International Corp.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21401 Vol. 13, No. 11, P. 54

TRASYS Hidden Line Program, TEKHIDN, developed to aid thermal engineer in viewing objects for thermal analysis. Designed to be run in conjunction with Rockwell International version of TRASYS thermal-analyzer program. TEKHIDN generates images of three-dimensional structures without showing background lines of objects. Hidden-line-removal aspect of program enables user to picture accurately orientations of objects being studied. Designed to be implemented on DEC VAX minicomputer using VAX VMS level 4.2 to 4.5. Tektronix terminal and Plot10 library required.

B89-10561

TRACING RAYS IN LASER-FRINGE ANEMOMETERS

KARL OWEN

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14535 Vol. 13, No. 11, P. 54

'OPTMAIN' is simple ray-tracing computer code developed to quantify refractive effects that result when laser-fringe anemometer used to observe flows through window. Code calculates changes for four different types of windows: flat-plate windows, simple cylindrical windows, 'general' axisymmetric windows, and smooth general-surface windows. Written in FORTRAN IV.

B89-10601

TWO-FREQUENCY ELECTRO-OPTIC GAS-CORRELATION SPECTROMETER

JACK S. MARGOLIS (Caltech), DAVID M. RIDER (Caltech), DANIEL J. MCCLEESE (Caltech), and JOHN T. SCHOFIELD (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17638 Vol. 13, No. 12, P. 40

Acoustical modulator not necessary. Two-frequency electro-optic gas-correlation spectrometer relatively simple. Illumination provided by ordinary lamp, no moving parts, and filtered output of detector is beat-frequency signal directly proportional to correlation between spectra of gases in cells.

B89-10602

SUBLIMING LAYERS WOULD REVEAL AERODYNAMIC EFFECTS

RONALD N. JENSEN

Dec. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13742 Vol. 13, No. 12, P. 40

In proposed technique, flow of fluid across surface studied in detail by use of multilayered, multicolored coating. Particularly useful in study of flow of air over small area of aerodynamic surface. By use of this method, incremental determinations made as to friction,

transfer of heat, positions of shock waves, and position and extent of turbulence on given surface. Technique applied to surface of model in wind tunnel or to aerodynamics surface on aircraft.

B89-10603

CORRECTING DISTORTIONS IN OPTICAL CORRELATORS

THOMAS G. CHRIEN (Caltech), and YEOU-YEN CHENG (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17176 Vol. 13, No. 12, P. 41

Coordinate transformation maps object space to correlation space. Theory developed to predict and correct typical anamorphic coordinate-transformation errors in off-axis Vander Lugt optical correlators.

B89-10604

OPTICAL MATRIX.MATRIX MULTIPLIER

GREGORY GHEEN (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17316 Vol. 13, No. 12, P. 42

Proposed apparatus for optical multiplication of two matrices based on Stanford optical vector.matrix multiplier. Does not require redundant representation of one of matrices. Because apparatus performs multiplication in fully parallel manner, incorporated as subsystem into large optical-processing system. Optical matrix.matrix multiplier processes inputs in fully parallel fashion, without redundant matrix images or ancillary intermediate electronic processing.

B89-10605

INFRARED PYROMETRY FROM ROOM TEMPERATURE TO 700 DEGREES C

DONALD R. WHEELER, WILLIAM R. JONES, JR., and STEPHEN V. PEPPER

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14872 Vol. 13, No. 12, P. 43

Consistent readings obtained when specimens prepared appropriately. New method largely overcomes limitations. Transmission of infrared increased by replacing customary metal-coated glass viewing port with quartz viewing port covered with tantalum mesh. Commercially available infrared microscope with focal distance of 53 cm focuses on spot only 1 mm wide on specimen. Microscope operated as radiometer. Output of detector varies by several orders of magnitude, processed by logarithmic amplifier before reading.

B89-10614

GLOBAL REFERENCE ATMOSPHERE MODEL (GRAM)

A. W. WOODRUM (Georgia Inst. of Tech.)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-23336 Vol. 13, No. 12, P. 48

GRAM series of four-dimensional atmospheric model validated by years of data. GRAM program, still available. More current are Gram 86, which includes atmospheric data from 1986 and runs on DEC VAX, and GRAM 88, which runs on IBM 3084. Program generates altitude profiles of atmospheric parameters along any simulated trajectory through atmosphere, and also useful for global circulation and diffusion studies.

B90-10011**WIDE-FIELD, TWO-STAGE OPTICAL SYSTEM**

PAUL K. MANHART (Caltech), APOSTOLIS A. DESLIS (Caltech), STEVE A. MACENKA (Caltech), and JAMES B. BRECKINRIDGE (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17392**Vol. 14, No. 1, P. 34**

Proposed telescope offers wide field of view, yet relatively inexpensive to manufacture. Design, in form of three Schmidt cameras, offers 10-degree strip field of view, single large-diameter collecting aperture, four spherical mirrors, and two diamond-turned aspheric mirrors in relatively compact configuration. Transference of large-diameter Schmidt corrector plate to smaller element makes this wide-field optical system suitable for application of two-stage optics theory. Concept enables cost-effective implementation of large-diameter optics by relaxing fabrication requirements.

B90-10012**BALLISTIC-ELECTRON-EMISSION MICROSCOPE**

WILLIAM J. KAISER (Caltech), and L. DOUGLAS BELL (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17384**Vol. 14, No. 1, P. 34**

Ballistic-electron-emission microscope (BEEM) employs scanning tunneling-microscopy (STM) methods for nondestructive, direct electrical investigation of buried interfaces, such as interface between semiconductor and thin metal film. In BEEM, there are at least three electrodes: emitting tip, biasing electrode, and collecting electrode, receiving current crossing interface under investigation. Signal-processing device amplifies electrode signals and converts them into form usable by computer. Produces spatial images of surface by scanning tip; in addition, provides high-resolution images of buried interface under investigation. Spectroscopic information extracted by measuring collecting-electrode current as function of one of interelectrode voltages.

B90-10013**ACOUSTOPHORESIS - A NEW SEPARATION CONCEPT**

JOSEPH S. HEYMAN

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13388**Vol. 14, No. 1, P. 38**

Ultrasound separates chemical species. Concept under development expands technology of chemical separation to include ultrasonic-radiation pressure. New technique separates species of particles according to ultrasonic properties. Acoustophoresis concept utilizes not only bulk compressional waves but also surface waves or boundary waves between solid (or liquid) container wall and subject liquid.

B90-10014**COMPACT, BROADBAND INFRARED SPECTROMETER**

NORMAN A. PAGE (Caltech), and MARY L. WHITE (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17562**Vol. 14, No. 1, P. 38**

Large-aperture, wide-angle, broad-band infrared spectrometer compact and light in weight. Based on double-pass version of Schmidt optical system that acts as both collimator and camera. Because optical system contained in piece of solid glass, it is mechanically and thermally stable. System made of water-free fused silica to minimize absorption of infrared radiation. Although in principle made from single, solid piece, in practice made in two pieces cemented together. Fabrication easier and simpler if more

cemented surfaces used so each optical surface grounded and polished like single lens element.

B90-10019**COMPUTING ORBITAL VIEWING PARAMETERS**

CHARLES PETRUZZO

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13083**Vol. 14, No. 1, P. 46**

QUIKVIS computer program calculates times during orbit around Earth when geometric requirements satisfied for observing celestial objects. Observed objects fixed (e.g. stars) or moving (Sun, Moon, planets). Useful for preflight analysis by those needing information on availability of celestial objects to be observed. Performs two types of analyses: One used when specific objects known, other when targets unknown and potentially useful regions of sky must be identified. Results useful in selecting candidate targets, examining effects of observation requirements, and doing gross assessments of effects of right ascension of ascending node (RAAN) of orbit. Written in FORTRAN 77.

B90-10055**HIGH-SENSITIVITY IONIZATION TRACE-SPECIES DETECTOR**

MARK T. BERNIUS (Caltech), and ARA CHUTJIAN (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17596**Vol. 14, No. 2, P. 38**

Features include high ion-extraction efficiency, compactness, and light weight. Improved version of previous ionization detector features in-line geometry that enables extraction of almost every ion from region of formation. Focusing electrodes arranged and shaped into compact system of space-charge-limited reversal electron optics and ion-extraction optics. Provides controllability of ionizing electron energies, greater efficiency of ionization, and nearly 100 percent ion-collection efficiency.

B90-10056**TWO TETHERED BALLOON SYSTEMS**

OTTO YOUNGBLUTH, THOMAS L. OWENS, and RICHARD W. STOREY

Feb. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18936)'NASA Langley Research Center Tethered Balloon Systems'

LAR-13837**Vol. 14, No. 2, P. 39**

Systems take meteorological measurements for variety of research projects. Report describes work done by NASA Langley Research Center in atmospheric research using tethered balloon systems composed of commercially available equipment. Two separate tethered balloon systems described in report have payloads and configurations tailored to requirements of specific projects. Each system capable of measuring atmospheric parameter or species in situ and then telemetering this data in real time to ground station. Meteorological data and concentration of ozone typically measured. Indicates instrumented tethered balloon systems have distinct advantages over other systems for gathering data on troposphere.

B90-10057**CELL MODEL OF A DISORDERED SOLID**

STEVEN T. J. PENG (Caltech), ROBERT F. LANDEL (Caltech), JOVAN MOACANIN (Caltech), ROBERT SIMHA (Case Western Reserve Univ.), and ELIZABETH PAPAZOGLU (Case Western Reserve Univ.)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

03 PHYSICAL SCIENCES

NPO-17217

Vol. 14, No. 2, P. 40

Elastic properties predicted from first principles. Paper discusses generalization of cell theory of disordered (non-crystalline) solid to include anisotropic stresses. Study part of continuing effort to understand macroscopic stress-and-strain properties of solid materials in terms of microscopic physical phenomena. Emphasis on derivation, from first principles, of bulk, shear, and Young's moduli of glassy material at zero absolute temperature.

B90-10058

CONVECTIVE EVAPORATION OF CLUSTERS OF DROPS

JOSETTE BELLAN (Caltech), and KENNETH G. HARSTAD (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17171

Vol. 14, No. 2, P. 42

Report presents results of continuing theoretical research in behaviors of sprayed liquid fuels at temperatures characteristic of furnaces. Two earlier papers arising from this investigation described in 'Evaporation of Dense Fuel Sprays' (NPO-16954).

B90-10059

SURVEY OF GAS-CORRELATION SPECTRORADIOMETRY

DANIEL J. MCCLEESE (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17345

Vol. 14, No. 2, P. 43

Principle application is remote sensing of atmospheres. Report discusses use of gas-correlation spectroradiometry in remote measurements of atmosphere of Earth and other planets. Summarizes history of technique from first such instrument flown aboard Nimbus 4 Satellite in 1970 to one that is to fly on Mars Observer Spacecraft to measure vertical distribution of water vapor and temperature. On Earth technique applied mostly to upper atmosphere and only infrequently to troposphere, where pressure broadening tends to blend spectral lines.

B90-10060

INTERPOLATION AND FFT OF NEAR-FIELD ANTENNA MEASUREMENTS

MARK S. GATTI (Caltech), and YAHYA RAHMAT-SAMII (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17597

Vol. 14, No. 2, P. 44

Bivariate Lagrange interpolation applied to plane-polar measurement scans. Report discusses recent advances in application of fast-Fourier-transform (FFT) techniques to measurements of near radiation fields of antennas on plane-polar grid. Attention focused mainly on use of such measurements to calculate far radiation fields. Also discussion of use of FFT's in holographic diagnosis of distortions of antenna reflectors. Advantage of scheme, it speeds calculations because it requires fewer data and manipulations of data than other schemes used for this purpose.

B90-10061

ABSORPTION OF GASES BY GLASSY POLYMERS

ROBERT F. FEDORS (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17636

Vol. 14, No. 2, P. 45

Report discusses solubility of gas in glassy polymer, both above and below glass-transition temperature (T_g). Thermodynamic arguments brought to bear on previously-developed mathematical

models, result being new model that enables calculation of infinite-dilution partial molar volume of solvent in glass or liquid solvent from data on pressure, volume, and temperature of solute in equilibrium with solvent.

B90-10064

MODEL OF ORBITAL DENSITY OF AIR FOR COMPUTING DRAG

W. M. LEAR (TRW, Inc.)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21154

Vol. 14, No. 2, P. 48

Simple, Orbital Density Model for Drag Equations program useful for computing effect of drag over one or more orbits. Mathematical model embodied in program incorporates major changes in density due to solar activity and magnetic activity of Earth. Diurnal (day/night) effects on orbit averaged out. Based on Jacchia daily-average density, evaluated at average time of year. Advantages, right ascension and declination of Sun not needed and computation time much reduced. Written in FORTRAN 77.

B90-10099

DOPPLER-SHIFTED RAMAN SPECTROSCOPY MEASURES FLOWS

REGINALD J. EXTON, MERVIN E. HILLARD, JR., WALTER R. LEMPET, PETER F. COVELL, and DAVID S. MILLER

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14133

Vol. 14, No. 3, P. 58

Technique for measuring velocity, static pressure, and translational temperature of flowing molecules by use of stimulated Raman spectroscopy demonstrated in supersonic wind tunnel at NASA Langley Research Center. Nonintrusive, accurate wind-tunnel measurements obtained without seeding flows. Optical equipment for vibration-free Raman doppler velocimetry in wind tunnel includes specially designed retrometer that reduces sensitivity of system to vibrations. This capability very valuable in aerodynamic testing and proves useful in wide variety of laboratory, industrial, and engineering applications.

B90-10100

LIGNIN SENSOR BASED ON FLASH-PYROLYSIS MASS SPECTROMETRY

EUG Y. KWACK (Caltech), DANIEL D. LAWSON (Caltech), and PARTHASARATHY SHAKKOTTAI (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17592

Vol. 14, No. 3, P. 62

New lignin sensor takes only few minutes to measure lignin content of specimen of wood, pulp, paper, or similar material. Includes flash pyrolyzer and ion-trap detector that acts as mass spectrometer. Apparatus measures amount of molecular fragments of lignin in pyrolysis products of samples. Helpful in controlling digestors in paper mills to maintain required lignin content, and also in bleaching plants, where good control of bleaching becomes possible if quick determination of lignin content made.

B90-10101

DIAGNOSIS OF A PRESSURE-MODULATOR-RADIOMETER CELL

RANDY D. MAY (Caltech), DANIEL J. MCCLEESE (Caltech), DAVID M. RIDER (Caltech), JOHN T. SCHOFIELD (Caltech), and CHRISTOPHER WEBSTER (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-17528**Vol. 14, No. 3, P. 63**

Spectral response of pressure-modulator-radiometer cell measured with help of lead-salt tunable diode laser. Laser chosen because of narrow bandwidths 2×10 to negative 4th power (cm) to negative 1st power and relatively high powers (up to 1 mW continuous) of such lasers and because available for wavelengths from 3 to 30 micrometers. Direct measurement of spectral response enables formulation of more-precise atmospheric-transmission functions, enabling extraction of better information from readings taken with instrument.

B90-10102**CALCULATING IRRADIANCE FOR PHOTOSYNTHESIS IN THE OCEAN**

DONALD J. COLLINS (Caltech), CURTISS O. DAVIS (Caltech), C. ROCKWELL BOOTH (Biospherical Instruments, Inc.), DALE A. KIEFER (University of Southern California), and CASSON STALLINGS (University of Southern California)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17645**Vol. 14, No. 3, P. 64**

Mathematical model predicts available and usable irradiances. Yields estimates of irradiance available for photosynthesis (Epar) and irradiance usable for photosynthesis (Epur) as functions of depth in ocean. Describes Epur and Epar in terms of spectral parameters measured remotely (from satellites or airplanes). These irradiances useful in studies of photosynthetic productivity of phytoplankton in euphotic layer.

B90-10103**TERRESTRIAL-IMAGING SPECTROSCOPY**

GREGG A. VANE (Caltech), and ALEXANDER F. H. GOETZ (Colorado Univ.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17432**Vol. 14, No. 3, P. 65**

Report reviews history and state of art of terrestrial imaging spectroscopy. Discusses history, design, and performance of Airborne Imaging Spectrometer (AIS), which is pioneering sensor for terrestrial high-resolution remote sensing. Also discusses recent developments described in literature of imaging spectroscopy from three points of view: techniques for handling and analysis of spectral-image data, geological research, and botanical research. This field encompasses use of airborne and spaceborne imaging spectrometers to generate specialized maps for use in agriculture, geology, ecology, and related disciplines.

B90-10159**ACOUSTIC HUMIDITY SENSOR**

PARTHASARATHY SHAKKOTTAI (Caltech), EUG Y. KWACK (Caltech), and SHAKKOTTAI VENKATESHAN (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17685**Vol. 14, No. 4, P. 47**

Industrial humidity sensor measures volume fraction of water in air via its effect on speed of sound. Only portion of sensor exposed to sensed atmosphere is pair of stainless-steel tubes, one containing dry air and other containing moist air. Counters measure intervals between reflected pulses. Sensor rugged enough for use in harsh environments like those used to control drying of paper in paper mills, where most humidity sensors do not survive.

B90-10160**COMPUTER SIMULATION OF CYCLIC OXIDATION**

H. B. PROBST, and C. E. LOWELL

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14890**Vol. 14, No. 4, P. 48**

Computer model developed to simulate cyclic oxidation of metals. With relatively few input parameters, kinetics of cyclic oxidation simulated for wide variety of temperatures, durations of cycles, and total numbers of cycles. Program written in BASICA and run on any IBM-compatible microcomputer. Used in variety of ways to aid experimental research. In minutes, effects of duration of cycle and/or number of cycles on oxidation kinetics of material surveyed.

B90-10161**INTEGRATED GRATING SPECTROMETER**

ROBERT J. LANG (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17733**Vol. 14, No. 4, P. 49**

Proposed integrated grating spectrometer made in waveguide layer on silicon wafer. Occupies area of about 2 centimeters to 2nd power on wafer 0.4 mm thick. Operates in visible spectrum (wavelengths of 400 to 700 nm) and blazed to diffract in first order. Array of integrated grating spectrometers performs spectral analysis of picture elements along line. Optical fiber couples light from each picture element into separate integrated spectrometer. Technique enables continuous independent variation, along grating, of pitch, curvature, and blaze angle. Grating designed to have large numerical aperture, zero aberration at two selected wavelengths, and very low aberration at intermediate wavelengths.

B90-10162**NET PHOTOREFRACTIVE GAIN IN GALLIUM ARSENIDE**

TSUEN-HSI LIU (Caltech), and LI-JEN CHENG (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17626**Vol. 14, No. 4, P. 50**

Prerequisite includes applied electric field. Electric field applied to GaAs crystal in which two infrared beams interfere. Depending on quality of sample and experimental conditions, net photorefractive gain obtained. Results offer possibility of new developments in real-time optical processing of signals by use of near-infrared lasers of low power.

B90-10163**IMPROVED LIQUID-ELECTRODE/SOLID-ELECTROLYTE CELL**

RATNAKUMAR V. BUGGA (Caltech), SALVADOR DISTEFANO (Caltech), ROGER M. WILLIAMS (Caltech), and CLYDE P. BANKSTON (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17604**Vol. 14, No. 4, P. 51**

Organic liquid in cathode extends working life. Rechargeable solid-electrolyte electrochemical cell includes novel mixture of organic and inorganic materials in liquid cathode. Operates at temperature about 120 to 170 degrees C lower than sodium/sulfur cells. Offers energy density comparable to that of sodium/sulfur cells - about 10 Wh/kg - and suited to such applications as military systems and electric vehicles.

B90-10164**X-RAY FLUORESCENCE SURFACE-CONTAMINATION DETECTOR**

HUDSON B. ELDRIDGE (University of Central Arkansas), and

03 PHYSICAL SCIENCES

RALPH CARRUTH

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27222

Vol. 14, No. 4, P. 52

X-ray spectrum of contaminating element reveals presence. Proposed x-ray fluorescence spectrometer used to detect thin layer of Conoco HD-2 (or equivalent) grease on D6-ac steel. Source-and-detector assembly mounted on remote manipulator with other contamination-detecting equipment and scanned across surface of specimen. Output of detector fed through coaxial cable to standard pulse-height-analyzing equipment and processed further by small computer to obtain x-ray energy spectrum.

B90-10165

PROCESSING OF MULTISPECTRAL DATA FOR IDENTIFICATION OF ROCKS

DIANE L. EVANS (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17581

Vol. 14, No. 4, P. 53

Linear discriminant analysis and supervised classification evaluated. Report discusses processing of multispectral remote-sensing imagery to identify kinds of sedimentary rocks by spectral signatures in geological and geographical contexts. Raw image data are spectra of picture elements in images of seven sedimentary rock units exposed on margin of Wind River Basin in Wyoming. Data acquired by Landsat Thematic Mapper (TM), Thermal Infrared Multispectral Scanner (TIMS), and NASA/JPL airborne synthetic-aperture radar (SAR).

B90-10220

OPTICAL MODULATION VIA THE PHOTOREFRACTIVE EFFECT

LI-JEN CHENG (Caltech), A. PARTOVI (Caltech), and E. GARMIRE (University of Southern California)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17460

Vol. 14, No. 5, P. 48

Rotation of polarization and use of analyzer yield large variations in intensity. Experiments show one beam of light used to change intensity of another beam via photorefractive effect in GaAs. Each beam causes polarization of other beam to rotate. Rotation detected by passing modulated beam through analyzer. Results agree closely with predictions of theory of photorefractive effect. Modulation scheme works with other photorefractive materials of similar crystallographic symmetry.

B90-10221

GENERATING SECOND HARMONICS IN NONLINEAR RESONANT CAVITIES

WILLIAM J. KOZLOVSKY (Stanford Univ.), C. DAVID NABORS (Stanford Univ.), and ROBERT L. BYER (Stanford Univ.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14051

Vol. 14, No. 5, P. 52

Single-axial-mode lasers pump very-low-loss doubling crystals. Important advance in making resonant generation of second harmonics possible for diode-laser-pumped solid-state lasers is recent development of monolithic nonplanar ring geometries in neodymium:yttrium aluminum garnet (Nd:YAG) lasers that produce frequency-stable single-mode outputs. Other advance is development of high-quality MgO:LiNbO₃ as electro-optically nonlinear material. Series of experiments devised to improve doubling efficiency of low-power lasers, and particularly of diode-laser-pumped continuous-wave Nd:YAG lasers.

B90-10222

CLASSIFICATION OF RADAR SCATTERERS VIA POLARIMETRIC DATA

JAKOB J. VAN ZYL (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17373

Vol. 14, No. 5, P. 54

Scattering mechanisms identified via polarization signatures. Algorithm automatically classifies radar-backscattering mechanisms in images produced by synthetic-aperture-radar polarimeter. Uses full polarimetric data from each picture element. These data generally expressed in terms of complex 2 by 2 scattering matrix equivalent to three independent amplitudes and three independent phases representing relationships between horizontally- and vertically-polarized components of transmitted and backscattered signals.

B90-10223

MOLECULAR ELECTRONIC SHIFT REGISTERS

DAVID N. BERATAN (Caltech), and JOSE N. ONUCHIC (Instituto de Fisica e Quimica)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17606

Vol. 14, No. 5, P. 55

Molecular-scale shift registers eventually constructed as parts of high-density integrated memory circuits. In principle, variety of organic molecules makes possible large number of different configurations and modes of operation for such shift-register devices. Several classes of devices and implementations in some specific types of molecules proposed. All based on transfer of electrons or holes along chains of repeating molecular units.

B90-10224

IMPROVED DESIGN FOR BIREFRINGENT FILTER

CLAYTON H. BAIR

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13887

Vol. 14, No. 5, P. 56

Highly selective laser tuning achieved without thin plates of questionable optical quality. Improved birefringent filter developed for use with broad-band-emission laser. Provides improved narrow-band operation and wavelength selectivity. New filter design improves traditional design by providing method of increasing wavelength separation between highly transmitted peaks. Such broad-band lasers becoming popular in scientific laboratories and useful in military applications and separation of isotopes.

B90-10225

RESPONSE OF CERAMIC INSULATION TO AEROTHERMODYNAMIC HEATING

DAVID A. STEWART, and DANIEL B. LEISER

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12156

Vol. 14, No. 5, P. 58

Thermal conductivities determined from engineering model used to predict accurately thermal responses of multicomponent insulation on spacecraft. Types of insulation studied include such composite parts as alumina-enhanced thermal barrier backed by low-density fibrous refractory material. Internal responses of various types of multicomponent insulation to aerothermodynamic heating calculated with help of computer program that implements engineering model for thermal conductivity. Transfer of heat by internal radiation plays major role in responses of fibrous materials at high temperatures and incorporated into model and program. Used in future spacecraft and exposed during reentry and

aerobraking maneuvers in outer atmosphere to environments even harsher than that of Space Shuttle.

B90-10274**COMPOUNDS GENERATE OPTICAL SECOND HARMONICS**

SETH R. MARDER (Caltech), and JOSEPH W. PERRY (Caltech)
Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17731**Vol. 14, No. 6, P. 56**

Newly synthesized organic salts found to generate relatively large second-harmonic signals when illuminated by fundamental signals in near-infrared spectrum. Made by crystallizing, with appropriate counterions, organic ions having large molecular hyperpolarizabilities. Large second-order nonlinear susceptibilities observed. These and other compounds having large nonlinear optical properties used in electro-optical modulators, switches, and signal-processing equipment.

B90-10275**DETERMINING POLARITIES OF DISTANT LIGHTNING STROKES**

RICHARD J. BLAKESLEE, and MARX BROOK (New Mexico Tech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26102**Vol. 14, No. 6, P. 56**

Method for determining polarities of lightning strokes more than 400 km away. Two features of signal from each stroke correlated. New method based on fact each stroke observed thus far for which polarity determined unambiguously, initial polarity of tail same as polarity of initial deflection before initial-deflection signal altered by propagation effects. Receiving station equipped with electric-field-change antenna coupled to charge amplifier having time constant of order of 1 to 10 seconds. Output of amplifier fed to signal-processing circuitry, which determines initial polarity of tail.

B90-10276**COMPACT SUNSHADE FOR TELESCOPE ANTENNA**

E. L. KERR (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17674**Vol. 14, No. 6, P. 58**

Proposed built-in sunshade enables large-aperture reflecting telescope to view laser transmitter apparently close to Sun, without adding excessive size or mass to telescope. Telescope looks through sunshade from behind and below. Tops of hexagonal tubes trimmed to spherical shape corresponding to sphere of rotation of telescope. Sunshade supports secondary reflector. Discerns signals from sources only 12 degrees from line of sight to Sun. Sunshade equipped with internal vanes running lengths of tubes receives signals from sources within 6 degree or even 3 degree of apparent position of Sun.

B90-10277**FAST QUENCHING FOR HYDROGEN-EMBRITTEMENT TESTS**

MARK J. PETRI (Rockwell International Corp.), RICHARD L. BURKHART (Rockwell International Corp.), and JOSEPH F. KONCEL (Rockwell International Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29549**Vol. 14, No. 6, P. 60**

Apparatus exposes hot metal specimens in hydrogen atmospheres to sudden cooling. Heater surrounds pressure vessel initially. On command, heater slides downward on track, exposing

vessel. Spray bar falls over vessel and directs high-pressure jets of cold water at it. Developed to evaluate susceptibilities of specimens to embrittlement by hydrogen. Cools specimens by 1,050 degrees F (580 degrees C) in 160 seconds.

B90-10278**MEASURING CONCENTRATION OF OZONE AUTOMATICALLY**

JOSEPH R. LAVELLE

Jun. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-21404)'An Automated Ozone Photometer'

ARC-12230**Vol. 14, No. 6, P. 60**

Airborne photometer measures absorption of ultraviolet. Automatically measures ozone concentrations in atmosphere to accuracy within 10 parts per billion. Air collected outside airplane enters photometer by way of transfer valve. Pressure and temperature of air measured simultaneously with transmissivity of air to ultraviolet light from lamp. Instrument has mass of 20.5 kg and fits in aluminum box measuring 78 by 58 by 25 cm. Compact, lightweight, low-power instrument developed for use on high-altitude research airplane.

B90-10279**PHOTOCHEMICAL DEGRADATION OF ORGANIC-SOLVENT FUMES**

JAMES J. HERZSTOCK (Rockwell International Corp.)

Jun. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29596**Vol. 14, No. 6, P. 61**

Quality of air in laboratory or industrial ventilation airstream enhanced by proposed technique. Source of ultraviolet light placed in airstream to degrade fumes photochemically. If fumes acceptable in degraded form, no further processing needed.

B90-10280**MATRIX VECTOR MULTIPLICATION IN THIN PHOTOREFRACTIVE CRYSTAL**

LI-JEN CHENG (Caltech), and GREGORY O. GHEEN (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17455**Vol. 14, No. 6, P. 62**

Thin GaAs device integrated with other electronic and optoelectronic devices. Experiments show matrix vector multiplication performed optically by four-wave mixing in thin crystal of GaAs. Concept applicable to thin crystals of other photorefractive materials having suitable electro-optical properties and same crystalline symmetry as that of GaAs.

B90-10281**NANO-G LABORATORY**

FRIEDRICH O. VON BUN, and O. K. GARRIOTT (Johnson Space Center)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13197**Vol. 14, No. 6, P. 63**

Freely floating platform isolated from all but gravity gradient forces. Report describes conceptual orbiting spacecraft laboratory that creates environment where acceleration does not exceed 10 to the negative 9th power that of normal acceleration at surface of Earth. Consists of two parts: outer part (spacecraft) and separable inner free-floating part housing experimental apparatus. Equipped with radio and/or optical communication links for control of experiment and recording of data. Used for research in such delicate phenomena as the lambda transition in helium, growth of crystals, and formation of alloys separating into constituents before solidification if gravitation (G) present.

B90-10282**CALIBRATION OF AIRBORNE VISIBLE/IR IMAGING SPECTROMETER**

G. A. VANE (Caltech), T. G. CHRIEN (Caltech), E. A. MILLER (Caltech), and J. H. REIMER (Caltech)
 Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17582**Vol. 14, No. 6, P. 63**

Paper describes laboratory spectral and radiometric calibration of Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) applied to all AVIRIS science data collected in 1987. Describes instrumentation and procedures used and demonstrates that calibration accuracy achieved exceeds design requirements. Developed for use in remote-sensing studies in such disciplines as botany, geology, hydrology, and oceanography.

B90-10332**AUTOMATIC REFILLING SYSTEM FOR LIQUID HELIUM**

ARISTIDES SERLEMITOS, MARK SANSEBASTIAN, JAY GEAGEN, and BRENT WARNER
 Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13270**Vol. 14, No. 7, P. 46**

Cryogenic experiments left unattended for days. System automatically replenishes liquid helium in cryogenic experimental apparatus as liquid evaporates. Automatic filling system transfers liquid helium from storage vessel to experimental apparatus under computer control. Gaseous helium from cylinder supplies pumping pressure. Circuit senses level of liquid helium by sensing voltage across measuring resistors in series with silicon resistance thermometers (SRT's). Low voltage indicates SRT covered, while high voltage indicates uncovered.

B90-10333**IMPROVED RADIOGRAPHY OF WOODEN PARTS**

MAGGIE L. BERRY, and ROBERT F. BERRY, JR.
 Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13724**Vol. 14, No. 7, P. 47**

Technique developed to increase radiographic contrasts of inherent latent defects in wood. Involves introduction of radiopaque substance into defect site and subjecting site to penetrating radiation. Radiopaque penetrant used is commercially available fluorocarbon cleaning solvent, trichlorotrifluoroethane. Applicable in inspection of wooden aircraft components, fan and wind-turbine blades, marine parts, insulators, and other wooden components, assemblies, and structures.

B90-10334**DETECTION OF GAS-PHASE POLYMERIZATION IN SIH4 AND GEH4**

YUH-HAN SHING (Caltech), JOSEPH W. PERRY (Caltech), and CAMILLO E. ALLEVATO (Caltech)
 Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17779**Vol. 14, No. 7, P. 47**

Inelastic scattering of laser light found to indicate onset of gas-phase polymerization in plasma-enhanced chemical-vapor deposition (PECVD) of photoconductive amorphous hydrogenated silicon/germanium alloy (a-SiGe:H) film. In PECVD process, film deposited from radio-frequency glow-discharge plasma of silane (SiH4) and germane (GeH4) diluted with hydrogen. Gas-phase polymerization undesirable because it causes formation of particulates and defective films.

B90-10335**IMPROVED ANALYSIS OF HEAT-PULSE DATA**

C. B. VINING (Caltech), A. ZOLTAN (Caltech), and J. W. VANDERSANDE (Caltech)
 Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17729**Vol. 14, No. 7, P. 48**

Equations derived to improve analysis of experimental data in flash method for measurement of thermal diffusivity and heat capacity. In flash method, pulse of radiant energy from flashlamp or other source deposited on front face of small, thin specimen, and temperature of rear face monitored as function of time. New equations account for both losses and exponentially decaying pulses.

B90-10336**PROGRAMMABLE MULTIZONE FURNACE**

EDMUND Y. TING (Grumman Corporate Research Center), and DAVID J. LARSON, JR. (Grumman Corporate Research Center)
 Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28375**Vol. 14, No. 7, P. 49**

Moving thermal gradients created without mechanical motion. Furnace having multiple, individually programmable heating zones developed for use in experiments on directional solidification. Holds rod specimen and generates thermal gradients moving along specimen. Elimination of translation mechanism makes furnace more compact and reduces vibrations, which disturb experiment. Availability of different temperature profiles through programming makes it versatile tool for research at low thermal gradients traveling at moderate speeds.

B90-10337**CALIBRATOR BLOCKS FOR COMPUTERIZED TOMOGRAPHY (CT)**

H. PETER ENGEL (EG&G Florida, Inc.)
 Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11397**Vol. 14, No. 7, P. 50**

Sets of calibrator blocks developed for use with industrial computerized tomography (CT) systems. Set of blocks (or number of stacked sets of blocks) placed on object table of CT system and scanned in usual way. Blocks include holes of known size, shape, and location. Appearance of holes in output image of CT system used to verify operation of system.

B90-10338**TEMPERATURE RISES IN PUMPS FOR SUPERFLUID HELIUM**

PETER KITTEL
 Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-27507) 'Temperature Rise in Superfluid Helium Pumps'

ARC-12264**Vol. 14, No. 7, P. 51**

Report discusses increases in temperature of superfluid helium in centrifugal and fountain-effect pumps. Intended for use in transfers of superfluid helium in outer space. Increases in temperature significantly affect losses during transfers and are important in selection of temperatures of supply tanks. Purpose of study, increase in temperature in fountain-effect pump calculated on basis of thermodynamic considerations, starting from assumption of ideal pump. Results of recent tests of ceramic material intended for use in such pumps support this assumption. Overall, centrifugal pumps more effective because it produces smaller rise in temperature.

B90-10339**EQUATIONS FOR ISOCALORIC FOUNTAIN-EFFECT PUMPS**
PETER KITTEL

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11850**Vol. 14, No. 7, P. 52**

Report presents equations for thermodynamical characteristics of leaky fountain-effect pumps operating at constant rates of input heating. Differ from those developed previously for fountain-effect pumps operating at constant differences of temperature, in which pressure heads and rates of flow independent of each other. Resulting equations used to calculate various measures of performance of leaky fountain-effect pump; e.g., pressure head as function of mass-flow rate, hydrothermodynamic efficiency, and transfer effectiveness (fraction of pumped mass remaining after portion evaporated to keep process at constant temperature).

B90-10340**ASTROMETRIC TELESCOPE FACILITY FOR THE SPACE STATION**

K. NISHIOKA, J. SCARGLE, and J. GIVENS

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11842**Vol. 14, No. 7, P. 52**

Paper discusses proposed Astrometric Telescope Facility, installed on Space Station to study motions of stars other than Sun and possibly detect planets around them. Measurements expected to verify, modify, or refute current theories about accretion of interplanetary clouds into stars and planets. Also measures motions and distances between stars and star clusters in nearby galaxies and in our own galaxy. System consists of six subsystems (optics, structure, thermal control, command and data, pointing and control, and power and harness) in addition to focal-plane instrument composed of Ronchi ruling and drive assembly, folding and field optics, multichannel astrometric photometer, and visible imager. Elements measure relative motions of stars with accuracy of 10 microarcseconds.

B90-10349**BIREFRINGENT-FILTER MODEL**

PATRICIA L. CROSS, and CLAYTON H. BAIR

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13945**Vol. 14, No. 7, P. 60**

Birefringent Filter Model computer program implements stand-alone mathematical model of birefringent filter for use in design and analysis of birefringent filter. Developed to aid in design of solid-state lasers used on aircraft or spacecraft in remote sensing of atmosphere. General enough to enable user to address such problems as temperature-stability requirements, manufacturing tolerances, and alignment tolerances. Written in Microsoft FORTRAN 2.0.

B90-10398**HEAT-FLUX-MEASURING FACILITY**

CURT H. LIEBERT, and DONALD H. WEIKLE

Aug. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-14418)'Heat Flux Measurements.'

LEW-14917**Vol. 14, No. 8, P. 42**

Apparatus simulates conditions in turbine engines. Automated facility generates and measures transient and steady-state heat fluxes at flux densities from 0.3 to 6 MW/m² and temperatures from 100 to 1,200 K. Positioning arm holds heat-flux gauge at focal point of arc lamp. Arm previously chilled gauge in liquid nitrogen in Dewar flask. Cooling water flows through lamp to heat exchanger. Used to develop heat-flux gauges for turbine blades

and to test materials for durability under rapidly changing temperatures.

B90-10399**MEASURING IRRADIANCE OVER LARGE AREAS**

STUART D. GLAZER (Caltech), and GEORG SIEBES (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17810**Vol. 14, No. 8, P. 42**

Relatively simple experimental technique yields data processed, via straightforward mathematical model, into map of thermal irradiance over large area. Imaging infrared radiometer makes temperature map of sheet. Irradiance distribution at sheet location then deduced from temperature map. Used to obtain rapid measurements of incident-flux distribution over broad spectral range at specific locations relative to such heat sources as infrared heat lamps or lasers.

B90-10400**IMPROVED MULTIPLE-SPECIES CYCLOTRON ION SOURCE**

GEORGE A. SOLI (Caltech), and DONALD K. NICHOLS (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17766**Vol. 14, No. 8, P. 43**

Use of pure isotope ⁸⁶Kr instead of natural krypton in multiple-species ion source enables source to produce krypton ions separated from argon ions by tuning cyclotron with which source used. Addition of capability to produce and separate krypton ions at kinetic energies of 150 to 400 MeV necessary for simulation of worst-case ions occurring in outer space.

B90-10401**SILICON DETECTORS FOR HELIUM LIQUID AND VAPOR**

M. J. DI PIRRO, and A. T. SERLEMITSOS

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13281**Vol. 14, No. 8, P. 44**

Simple electrical-resistance devices made of silicon indicate whether helium liquid or helium vapor present. Devices designed primarily for use in outer space, were tested and found to operate in normal Earth gravity. Silicon cubes supported by stainless-steel wires and strips. Voltage across each cube at fixed current indicates whether immersed in helium liquid or vapor. Liquid cools more than vapor does, resulting in greater electrical resistance. Such helium-liquid/vapor detectors incorporated into ducts or containers of laboratory equipment, and used to infer locations of liquid/vapor interfaces in order to measure quantities of liquid and vapor or to control refill operations.

B90-10402**ISOTHERMAL CALORIMETER**

JOHN J. ROWLETTE (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17419**Vol. 14, No. 8, P. 44**

Pressure-feedback signal indicates rate of heating. Improved isothermal calorimeter measures rate of heating in object under test. Called 'isothermal' because chamber holding object and its environment maintained at or near constant temperature to minimize spurious transfers of heat introducing errors into measurements. When item under test generates heat, rate of boiling and pressure in inner chamber increase. Servo-valve opens wider to maintain preset differential pressure. Valve-control voltage used as measure of rate of heating.

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B90-10403

LASER SCHLIEREN SYSTEM DETECTS SOUNDS OF LEAKS

PARTHASARATHY P. SHAKKOTTAI (Caltech), and A. VIJAYARAGAVAN ALWAR (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17009

Vol. 14, No. 8, P. 45

Hostile environments monitored safely and noninvasively. Modified laser schlieren system acts as microphone to detect sounds of leaks remotely. Sensitive to acoustical frequencies above audible range and especially suited for monitoring leaks of high-pressure steam from boilers or chemical vapors from processing equipment. Does not require placement of delicate equipment in harsh environment monitored, and no contact needed with boiler or other unit being monitored. Detects sound waves via variation of index of refraction of air at acoustical frequencies. Used to monitor sound frequencies beyond range of human hearing.

B90-10404

CHAMBER FOR TESTING POLYMERS IN OXYGEN PLASMA

ANN F. WHITAKER

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28368

Vol. 14, No. 8, P. 46

Apparatus holds polymer specimen at constant temperature while exposing it to oxygen plasma. Copper tube (part of cooling coil) extends into plasma chamber, supporting copper block and thermoelectric module on which specimen mounted. Copper block made small - 4.4 by 3.8 by 1.6 cm - having little effect on plasma. Used to evaluate resistances of polymer materials to plasma environments, and for analysis of gases produced by attack of plasma on polymer specimen.

B90-10453

LINEAR ION TRAP FOR ATOMIC CLOCK

JOHN D. PRESTAGE (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17758

Vol. 14, No. 9, P. 44

Linear, radio-frequency ion trap increases frequency stability of atomic frequency standard device. Confines ions with less radio-frequency motion than does point ion trap.

B90-10454

MAKING TOPOGRAPHICAL MAPS FROM SAR AND FLOOD-GAUGE DATA

MARC LEE IMHOFF

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13212

Vol. 14, No. 9, P. 44

Collection of computer programs processes image data obtained by synthetic-aperture radar (SAR) along with measurements of water levels taken at selected points on ground to generate three-dimensional maps of surveyed terrain. Information in maps presented in variety of useful ways suited to study of such phenomena as flooding, damage caused by floods, flow of nutrients from forests to river and marine ecosystems, and effects of subsidence of ground or of rising sea levels.

B90-10455

CONCENTRATING GASEOUS CONTAMINANTS FOR MONITORING

WILLIAM C. MAHONE (Lockheed Engineering and Management Services Co., Inc.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21424

Vol. 14, No. 9, P. 45

Apparatus concentrates contaminants outgassing from specimens in vacuum and passes concentrated contaminants to gas-chromatography/mass-spectrometry system for analysis. Cold wall of collection chamber adsorbs gases from specimen in isothermal cell. When wall heated, plate desorbs gases so they can be analyzed. Collection chamber maintained at low pressure throughout adsorption and desorption process. Determines whether candidate materials for use in vacuum environments generate harmful substances.

B90-10456

HIGH-PRESSURE PROMOTED-COMBUSTION CHAMBER

MICHELLE A. RUCKER, and JOEL M. STOLTZFUS

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21470

Vol. 14, No. 9, P. 46

Proposed combustion-testing chamber burns specimens of materials in fully contained, high-pressure oxygen atmosphere. Test operator uses handles on threaded retaining rings to attach or remove top or bottom plates sealing combustion chamber. Tests conducted in static or flowing oxygen. Oxygen inlet and outlet far enough above burning specimen, little danger of entrainment of burning fragments in oxygen flowing out.

B90-10457

CATALYTIC DESTRUCTION OF TOXIC ORGANIC COMPOUNDS

GERALD E. VOECKS (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17669

Vol. 14, No. 9, P. 46

Proposed process disposes of toxic organic compounds in contaminated soil or carbon beds safely and efficiently. Oxidizes toxic materials without producing such other contaminants as nitrogen oxides. Using air, fuel, catalysts, and steam, system consumes less fuel and energy than decontamination processes currently in use. Similar process regenerates carbon beds used in water-treatment plants.

B90-10458

COMPUTING DEFORMATIONS OF RUBBERY MATERIALS

STEVEN T. J. PENG (Caltech), ERIC B. BECKER (Becker and Miller), and TRENT M. MILLER (Becker and Miller)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17670

Vol. 14, No. 9, P. 47

Better use made of experimental data in finite-element computations. New formulation of constitutive equations of rubbery, nonlinearly elastic material enables finite-element analysis of boundary-value stress-and-strain problems involving arbitrary shapes and loads. In development of formulation, principal stretches used as arguments of strain-energy-density function.

B90-10459

BEHAVIOR OF EVAPORATING LIQUID DROPS IN CLUSTERS

JOSETTE BELLAN (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17843

Vol. 14, No. 9, P. 61

Report presents critical analysis of methods, developed for calculating behavior of evaporating liquid drops in dense and dilute

clusters. Essential to understanding variety of physical and chemical phenomena occurring in combustion of sprayed fuels and in sprays used in agriculture, food industry, and painting. Presents insights on important aspects of two-phase flow.

B90-10460**DIRECTIONAL SOLIDIFICATION OF MONOTECTIC ALLOYS**

B. K. DHINDAW (Alabama Univ.), D. M. STEFANESCU (Alabama Univ.), A. K. SINGH (Alabama Univ.), and P. A. CURRERI (Alabama Univ.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26080**Vol. 14, No. 9, P. 61**

Conditions promoting formation of aligned fibers sought. Report describes experiments in directional solidification of Cu/Pb and Bi/Ga monotectic alloys. Study motivated by need to understand physical mechanism governing formation of rodlike or fiberlike aligned structures in solidifying alloy and to determine process conditions favoring such structures.

B90-10466**CALCULATING PERFORMANCES OF FABRY-PEROT ETALONS**

PATRICIA L. CROSS, and CLAYTON H. BAIR

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14055**Vol. 14, No. 9, P. 66**

Effects of changes in design determined quickly. Etalon Model computer program implements stand-alone mathematical model of an etalon. Designed to perform calculations over many wavelengths. Used to determine sensitivity of filter to changes in temperature, thickness tolerances, or alignment angles of etalon design. Calculates several performance parameters of etalons by use of equations in closed form, and calculates transmission as function of wavelength and uses transmission data to determine additional performance parameters. Developed on IBM PS/2 Model 80-071 computer using Microsoft version 4.01 FORTRAN compiler.

B90-10467**COMPUTING IMPINGEMENTS OF ROCKET EXHAUSTS**

M. CERIMELE (Lockheed Engineering and Management Services Co.), and B. DRAKE (Lockheed Engineering and Management Services Co.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21419**Vol. 14, No. 9, P. 67**

SFPLIMP, Source Flow Plume Impingement Program, computes forces, moments, contamination, and heating rates caused by impingement of plumes on orbiting spacecraft from jets firing at high altitudes. User chooses among variety of configurations, data, and theories. Written in FORTRAN 77 and VAX DCL.

B90-10468**SIMPLIFIED CALCULATION OF SOLAR FLUXES IN SOLAR RECEIVERS**

PRADEEP BHANDARI (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17732**Vol. 14, No. 9, P. 68**

Simplified Calculation of Solar Flux Distribution on Side Wall of Cylindrical Cavity Solar Receivers computer program employs simple solar-flux-calculation algorithm for cylindrical-cavity-type solar receiver. Results compare favorably with those of more complicated programs. Applications include study of solar energy

and transfer of heat, and space power/solar-dynamics engineering. Written in FORTRAN 77.

B90-10523**SCHLIEREN SYSTEM FOR FLOW STUDIES IN ROUND GLASS PIPES**

ROBERT C. COSTEN, DAVID B. RHODES, and STEPHEN B. JONES

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13944**Vol. 14, No. 10, P. 58**

In schlieren system for studying flow of gas in transparent pipe of circular cross section, cylindrical lenses placed on opposite sides of pipe compensate for refraction caused by wall of pipe. Enables direct visualization of such phenomena as laminar or turbulent flow, shock waves, vortices, and flow separations in systems having inherently cylindrical geometry; potentially unreliable extrapolations from results in flat-sided test cells no longer necessary.

B90-10524**OPTICAL PSEUDOCOLOR ENCODING OF GRAY-SCALE IMAGE**

TIEN-HSIN CHAO (Caltech), and HUA-KUANG LIU (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17764**Vol. 14, No. 10, P. 59**

Optical encoding much faster than digital electronic encoding. In optical pseudocolor-encoding apparatus brightness modulation in image from television camera transformed into polarization modulation in LCTV, and then into pseudocolor modulation in image on projection screen. Advantageous for such purposes as thermography, inspection of circuit boards, mammography, and mapping.

B90-10525**MEASURING RESPONSE OF PROPELLANT TO OSCILLATORY HEAT FLUX**

LEON D. STRAND (Caltech), KEN SCHWARTZ (Caltech), and SHAWN P. BURNS (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17428**Vol. 14, No. 10, P. 59**

Apparatus for research in combustion of solid propellants measures oscillatory response of rate of burning to oscillating thermal radiation from modulated CO₂ laser. Determines response to rate of burning to equivalent oscillation in pressure. Rod of propellant mounted in burner assembly including waveguide at one end and infrared window at other end. Microwave Doppler velocimeter measures motion of combustion front. Microwave, laser-current, and heat-flux signals processed into and recorded in forms useful in determining desired response of propellant.

B90-10526**NONDESTRUCTIVE TECHNIQUE TO ASSESS EMBRITTLEMENT IN STEELS**

SIDNEY G. ALLISON, WILLIAM T. YOST, and JOHN H. CANTRELL

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13817**Vol. 14, No. 10, P. 64**

Recent research at NASA Langley Research Center led to identification of nondestructive technique for detection of temper embrittlement in HY80 steel. Measures magnetoacoustic emission

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associated with reversible motion of domain walls at low magnetic fields. Of interest to engineers responsible for reliability and safety of various dynamically loaded and/or thermally cycled steel parts. Applications include testing of landing gears, naval vessels, and parts subjected to heat, such as those found in steam-pipe fittings, boilers, turbine rotors, and nuclear pressure vessels.

B90-10527

RADIATIVE PROCESSES IN AIR EXCITED BY AN ARF LASER ROBERT L. MCKENZIE, WINIFRED HUO, and GABRIEL LAUFER (Analatom, Inc.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12136

Vol. 14, No. 10, P. 66

Report describes experimental and theoretical studies of emission spectrum of air excited by light from ArF laser. Purpose of studies to determine conditions under which fluorescence from O₂ used to measure temperatures in aerodynamic flows.

B90-10528

MORE ABOUT EVAPORATION IN CLUSTERS OF DROPS JOSETTE BELLAN (Caltech), and KENNETH G. HARSTAD (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17594

Vol. 14, No. 10, P. 67

Report presents theoretical study of evaporation in clusters of spray drops in liquid fuel. Related to reports described in 'Turbulence and Evaporation in Clusters of Drops' (NPO-17323) and 'Effects of Turbulence on Ignition' (NPO-17335). Purpose of study to improve theoretical description of transport of molecular species, mass, and heat between cluster and its surroundings.

B90-10529

ELECTROSTATIC DISPERSION OF DROPS IN CLUSTERS JOSETTE BELLAN (Caltech), and KENNETH G. HARSTAD (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17516

Vol. 14, No. 10, P. 67

Electrical charging speeds evaporation. Report presents theoretical study of evaporation and dispersion of electrostatically charged clusters of drops in liquid fuel sprays. Represents extension of studies described in article, 'More About Evaporation of Drops in Clusters' (NPO-17594). Undertaken in effort to learn how electrostatic atomization used to disperse fuel better in order to reduce formation of soot in diesel engines and other power and combustion systems.

B90-10530

PRELIMINARY ANALYSIS OF DATA FROM AVIRIS JAMES E. CONEL (Caltech), GREGG A. VANE (Caltech), ROBERT O. GREEN (Caltech), RONALD E. ALLEY (Caltech), VERONIQUE CARRERE (Caltech), CAROL J. BRUEGGE (Caltech), and ANDY GABELL (CSIRO)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17622

Vol. 14, No. 10, P. 68

Report presents preliminary analysis of performance of Airborne Visible/Infrared Imaging Spectrometer (AVIRIS), a scanning instrument producing images at wavelengths from 400 to 2,450 nm. Includes four spectrometers connected by optical fibers to common set of foreoptics. Focuses upon calibration of instrument

and determination of reflectance of surface of Earth from its measurements.

B90-10531

TEMPERATURE DEPENDENCE OF SINGLE-EVENT EFFECTS

JAMES R. COSS (Caltech), DONALD K. NICHOLS (Caltech), LAWRENCE S. SMITH (Caltech), MARK A. HUEBNER (Caltech), and GEORGE A. SOLI (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17870

Vol. 14, No. 10, P. 70

Report describes experimental study of effects of temperature on vulnerability of integrated-circuit memories and other electronic logic devices to single-event effects - spurious bit flips or latch-up in logic state caused by impacts of energetic ions. Involved analysis of data on 14 different device types. In most cases examined, vulnerability to these effects increased or remain constant with temperature.

B90-10577

ADJUSTABLE INDUCTION-HEATING COIL

ROD ELLIS, and PAUL BARTOLOTTA

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-26399)'A High Temperature Fatigue And Structure Testing Facility'.

LEW-14963

Vol. 14, No. 11, P. 50

Improved design for induction-heating work coil facilitates optimization of heating in different metal specimens. Three segments adjusted independently to obtain desired distribution of temperature. Reduces time needed to achieve required temperature profiles.

B90-10578

FIBER-OPTIC COUPLER AND DYNAMIC-RANGE ENHANCER FOR CARS

ANDREW D. CUTLER (George Washington Univ.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14235

Vol. 14, No. 11, P. 52

Simpler equipment yields higher coupling efficiency with fewer adjustments. In improved scheme for coupling coherent anti-Stokes Raman spectroscopy (CARS) signal from measurement volume to monochromator, optical fiber and two lenses used in place of previous system. Cylindrical lenses focus light from optical fiber into beam of approximately rectangular cross section at input plane of monochromator. Optical wedge diverts part of beam in monochromator to produce less-intense secondary image.

B90-10579

KD2PO4 POLARIZATION MODULATOR WITH LARGE FIELD OF VIEW

EDWARD A. WEST

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28418

Vol. 14, No. 11, P. 54

Improved potassium dideuterium phosphate (KD₂PO₄) electro-optical linear-polarization modulator suitable for use with optical instruments having large (wide-angle) fields of view. Errors previously caused by convergence of light eliminated.

B90-10580

TWO RADIATIVE/THERMOCHEMICAL INSTRUMENTS

RALPH M. TAPPHORN (Lockheed Engineering and Sciences Co.), DWIGHT D. JANOFF (Lockheed Engineering and Sciences Co.), and RICHARD M. SHELLEY (Lockheed Engineering and Sciences

Co.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21639 MSC-21640**Vol. 14, No. 11, P. 54**

Measurements of absorption and emission complement thermal measurements. Two laboratory instruments for research in combustion and pyrolysis equipped for radiative as well as thermal measurements. One instrument essentially differential scanning calorimeter (DSC) modified to detect radiation emitted by flames. Provides means to evaluate limits of flammability of materials exhibiting exothermic reactions in DSC's. Other instrument used to determine pyrolysis properties of specimens exposed to various gases by measurement of infrared absorption spectra of pyrolysis products.

B90-10581**TWO-WAVELENGTH OPTICAL-PATH-DIFFERENCE MAPPING**

PAUL K. MANHART (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17725**Vol. 14, No. 11, P. 55**

Proposed technique for measuring shapes and alignments of reflectors based on use of two-wavelength absolute-distance interferometer to generate optical-path-difference maps of reflecting or refracting surfaces. Facilitates such tasks as determining manufacturing and alignment errors of off-axis segment of large-aperture paraboloidal telescope mirror, or aligning all segments of such mirror. Suitable for use where reflecting surfaces highly aspherical, initial misalignments large, and/or surface errors exceed optical wavelengths.

B90-10582**MICROPHONE DETECTS WAVES IN LAMINAR BOUNDARY-LAYER FLOW**

JAMES M. KENDALL (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17479**Vol. 14, No. 11, P. 56**

Simple noninvasive acoustical technique effective in measurement of instability waves, which precede onset of turbulence in laminar boundary layer flows. Microphone mounted below surface detects pressure waves indicative of instabilities in laminar flow. Relatively insensitive to long-wavelength background noise. Such measurements important in research on aerodynamic flows and potential applications in control of turbulence (with consequent reduction of drag) on aircraft.

B90-10583**MONOLITHIC UNIDIRECTIONAL PLANAR RING LASER**

ALAN C. NILSSON (Stanford Univ.), and ROBERT L. BYER (Stanford Univ.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14045**Vol. 14, No. 11, P. 58**

Operation based on induced birefringence of stressed laser medium. Unidirectional operation of ring laser made possible by polarization-dependent differential loss induced by some combination of reciprocal and nonreciprocal polarization effects. Concept arises from theoretical analysis of monolithic unidirectional nonplanar ring laser described in article, 'Monolithic Unidirectional Nonplanar Ring Laser' (LAR-14146). Potential for use in metrology and spectroscopy.

B90-10584**MONOLITHIC UNIDIRECTIONAL NONPLANAR RING LASER**

ALAN C. NILSSON (Stanford Univ.), and ROBERT L. BYER (Stanford Univ.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14146**Vol. 14, No. 11, P. 58**

New design has six reflecting surfaces. Differential loss required to achieve unidirectional oscillation 100 times as great as with four reflecting surfaces. Concept provides for narrow-linewidth operation in relatively inexpensive Nd:glass. Potential applications in metrology and spectroscopy.

B90-10585**ADHESION BETWEEN PARTICLES AND SURFACES IN A****VACUUM**

JACK B. BARENGOLTZ (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17743**Vol. 14, No. 11, P. 60**

Report discusses experimental study of adhesion between several kinds of particles and solid surfaces. Purpose of investigation to extend available data on adhesion of contaminant particles and to contribute to understanding of ways in which acceleration redistributes contaminant particles, causing increases or decreases in contamination.

B90-10625**FLUX JACOBIAN MATRICES FOR EQUILIBRIUM REAL GASES**

MARCEL VINOKUR (Sterling Federal Systems, Inc.)

Dec. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-17445)'Flux Jacobian Matrices and Generalized Roe Average for an Equilibrium Real Gas.'

ARC-12409**Vol. 14, No. 12, P. 28**

Improved formulation includes generalized Roe average and extension to three dimensions. Flux Jacobian matrices derived for use in numerical solutions of conservation-law differential equations of inviscid flows of ideal gases extended to real gases. Real-gas formulation of these matrices retains simplifying assumptions of thermodynamic and chemical equilibrium, but adds effects of vibrational excitation, dissociation, and ionization of gas molecules via general equation of state.

B90-10626**BEAM STOP FOR HIGH-POWER LASERS**

IAIN S. MCDERMID (Caltech), and WILLIAM B. WILLIAMSON (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17465**Vol. 14, No. 12, P. 28**

Graphite/aluminum plate absorbs most of light. Beam stop fits on standard optical mounting fixture. Graphite plate thick enough to absorb incident laser beam but thin enough to transfer heat quickly to heat sink. Device used for variety of blocking purposes. For example, blocks laser beam after it passes through experimental setup, or at each stage of setup so stages checked and tested in sequence. Negligible reflectance of device is valuable safety feature, protecting both users and equipment from reflections.

B90-10627**NUMERICAL METHODS FOR CHEMICALLY REACTING FLOWS**

R. J. LEVEQUE (Washington Univ.), and H. C. YEE

Dec. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-18343)'A Study of Numerical Methods for Hyperbolic Conservation Laws with Stiff

03 PHYSICAL SCIENCES

Source Terms.'

ARC-12282 Vol. 14, No. 12, P. 30

Issues related to numerical stability, accuracy, and resolution discussed. Technical memorandum presents issues in numerical solution of hyperbolic conservation laws containing 'stiff' (relatively large and rapidly changing) source terms. Such equations often used to represent chemically reacting flows. Usually solved by finite-difference numerical methods. Source terms generally necessitate use of small time and/or space steps to obtain sufficient resolution, especially at discontinuities, where incorrect mathematical modeling results in unphysical solutions.

B90-10628

ANALYSIS OF USED ARC-JET ELECTRODES

THOMAS J. PIVIROTTO (Caltech), and WILLIAM D. DEININGER (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17575 Vol. 14, No. 12, P. 30

Report discusses conditions of electrodes used in arc-jet engine. Electrodes examined in effort to determine causes of erosion and to develop recommendations for improved electrode designs yielding longer operating lives.

B90-10629

FURTHER STUDIES OF HOT-WIRE ANEMOMETRY

ROBERT MCKENZIE, PAMELA LOGAN (Stanford Univ.), and DANIEL BERSHADER (Stanford Univ.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12104 Vol. 14, No. 12, P. 31

Report discusses factors affecting readings of hot-wire anemometer in turbulent supersonic boundary layer. Represents extension of work described in 'Hot-Wire Anemometry Versus Laser-Induced Fluorescence' (ARC-11802). Presents theoretical analysis of responses of hot-wire probe to changes in flow; also compares measurements by hot-wire probe with measurements of same flows by laser-induced fluorescence (LIF).

B90-10630

OPTIMIZATION OF ARRAY OF LASER RETROREFLECTORS

SHLOMO DOLINSKY (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17778 Vol. 14, No. 12, P. 31

Report discusses analysis and optimization of design of array of corner-cube prism retroreflectors for use on TOPEX satellite. Analysis builds on methodology developed for array antennas where far-field pattern-shape requirements dictate optimum orientation and location of antenna elements, in this case laser retroreflectors. Reviews design requirements for array and describes signal-attenuation effects that must be considered.

04 MATERIALS

B86-10036

LOW-GRAVITY ALLOY STUDIES ON AIRCRAFT

P. A. CURRERI, M. H. JOHNSTON, R. E. SHURNEY, W. S. ALTER, D. M. STEFANESCU, and J. C. HENDRIX
Jun. 1986

MFS-25967 Vol. 10, No. 1, P. 80

Controlled solidification continued through many dives. Since each dive gives 20 to 30 seconds in which gravity is 0.001 to 0.1 its normal value, and aircraft may make about ten low-gravity maneuvers in mission, technique allows substantial time to conduct a low-gravity experiment. In directional solidification, liquid/solid interface advanced slowly through rod of sample alloy. Solidification continues during several aircraft maneuvers. Known solidification rate of sample correlated with accelerometer data to find gravity value during solidification for any point in sample. Thermal gradient and solidification rate controlled independently.

B86-10037

MONITORING PREPREGS AS THEY CURE

P. R. YOUNG, J. R. GLEASON (U.S. Army Structures Laboratory), and A. C. CHANG (Kentron International, Inc.)

Jun. 1986

LAR-13335 Vol. 10, No. 1, P. 82

Quality IR spectra obtained in dynamic heating environment. New technique obtains quality infrared spectra on graphite-fiber-reinforced, polymeric-matrix-resin prepregs as they cure. Technique resulted from modification of diffuse reflectance/Fourier transform infrared (DR/FTIR) technique previously used to analyze environmentally exposed cured graphite composites. Technique contribute to better understanding of prepreg chemistry/temperature relationships and development of more efficient processing cycles for advanced materials.

B86-10038

LOW-COBALT POWDER-METALLURGY SUPERALLOY

F. H. HARF

Jun. 1986

LEW-14113 Vol. 10, No. 1, P. 84

Highly-stressed jet-engine parts made with less cobalt. Udimet 700* (or equivalent) is common nickel-based superalloy used in hot sections of jet engines for many years. This alloy, while normally used in wrought condition, also gas-atomized into prealloyed powder-metallurgy (PM) product. Product can be consolidated by hot isostatically pressing (HIPPM condition) and formed into parts such as turbine disk. Such jet-engine disks 'see' both high stresses and temperatures to 1,400 degrees F (760 degrees C).

B86-10039

MAKING HIGH-POROSITY ALLOY SPHEROIDS

E. C. ETHRIDGE, P. A. CURRERI, and M. KELLEY

Jun. 1986

MFS-25997 Vol. 10, No. 1, P. 85

Noncontact process yields low-density, porous microstructure. Small spheroids of porous alloys with large surface area per unit volume produced by containerless processing method. Without container walls to serve as nucleation sites, alloy cools to well below normal freezing point without solidifying. Solidification then proceeds rapidly; interdendritic liquid pulled out by growing crystals, resulting in porous microstructure. The more rapid the cooling rate, the faster crystals grow and more porous solid becomes. Drop-tube method useful in creating porous microstructures from other materials including oxides, carbides, and organic materials. Other means of containerless processing - acoustic or air-jet levitation, low-gravity float melting, melt spinning, or jet spraying, adapted to process.

B86-10040

REDUCING SODIUM CONTAMINATION IN MOS DEVICES

R. F. DEHAYE, and W. R. FELTNER
Jun. 1986

MFS-28034

Vol. 10, No. 1, P. 86

Method of removing positive ions from oxides in metal-oxide-semiconductor (MOS) transistors and integrated circuits ensure freedom from contamination by sodium and other mobile positive ions. Electric field applied during oxide growth to push mobile Na⁺ ions to surface. After cooling from growth temperature, field turned off and Na⁺ contaminated surface layer etched away. New method intended to supplement established methods of minimizing ion contamination, such as scrupulous cleanliness in processing, purging with hydrogen chloride to react with and remove contaminants, and growing extra-thick gate oxide, then etching it to remove large portion of contaminants concentrated near surface.

B86-10041

PRESSURE-SENSITIVE RESISTOR MATERIAL

E. R. DU FRESNE (Caltech)

Jun. 1986

NPO-16537

Vol. 10, No. 1, P. 86

Low-conductivity particles in rubber offer wide dynamic range. Sensor consists of particles of relatively low conductivity embedded in rubber. Resistance of sensor decreases by about 100 times as pressure on it increases from zero to 0.8 MN/M to the second power. Resistor promising candidate as tactile sensor for robots and remote manipulators.

B86-10042

COLORLESS POLYIMIDE CONTAINING PHENOXY-LINKED DIAMINES

A. K. ST. CLAIR, and T. L. ST. CLAIR

Jun. 1986

LAR-13353

Vol. 10, No. 1, P. 87

Tough, optically transparent films produced. Polyimides having this molecular structure form tough, transparent films. Films made transparent by careful control of manufacturing conditions, including use of highly purified monomers. Need for high-temperature, flexible polymeric films and coating material that have high optical transparency in 300- to 600nm range of electro-magnetic spectrum for use on antennas, solar cells, and thermalcontrol coatings.

B86-10127

BALL-AND-SOCKET MOUNT FOR INSTRUMENTS

E. KAELEBER (Perkin-Elmer Corp.)

May 1986

MFS-28064

Vol. 10, No. 2, P. 78

Jaws engage instrument precisely but release it readily. Mounting mechanism holds scientific instrument securely, allows instrument to be oriented, and minimizes conduction of heat to and from instrument. Mechanism also allows quick replacement of instrument.

B86-10128

Si₃N₄-BASED CERAMIC WITH GREATER HOT STRENGTH

S. DUTTA, and B. BUZEK

May 1986

LEW-14193

Vol. 10, No. 2, P. 80

Zr-doped material outperforms MgO-doped material above 1,200 degrees C. New ceramic material produced by addition of 10 weight percent zirconia (yttria-stabilized zirconia) to (silicon nitride) offers significantly-improved high-temperature properties (those of MgO-doped Si₃N₄ ceramic). Work also showed that controlled Si₃N₄ powder with 10 weight percent zirconia, significant improvement in room-temperature strength achieved. Variety of high-temperature structural applications are silicon nitride and silicon carbide. Potential for use in aircraft and automobile engines and in electric-power generating systems. Improved properties

strongly suggest that the 10-weight percent zirconia/Si₃N₄ material has strong potential for high-temperature applications.

B86-10129

COMPRESSION-FAILURE MECHANISMS IN COMPOSITE LAMINATES

M. J. SHUART, J. G. WILLIAMS, and P. A. COOPER

May 1986 See Also (N81-26183 and N84-20259)

LAR-13345

Vol. 10, No. 2, P. 80

Failure mechanisms observed using transparent fiberglass/epoxy birefringent materials. Technique based on use of transparent fiberglass/epoxy birefringent material. Transparency allows visual observation of location of initial laminate failure and of subsequent failure propagation; birefringence allows laminate stress distribution to be observed during test and also after test if permanent residual stresses occur. Nondestructive technique developed to observe failure as it develops and as propagates within laminate.

B86-10130

DETOXIFICATION OF HALON FIRE-EXTINGUISHANT PRODUCTS

E. L. MILLER (Lockheed Engineering & Management Services, Inc.)

May 1986

MSC-20962

Vol. 10, No. 2, P. 82

Ammonia compounds absorb toxic hydrogen halides as they are produced. Toxic acid vapors resulting from use of Halon (or equivalent) fire extinguishers immediately changed into nontoxic ammonium compounds when extinguishers contain some ammonia or ammonium carbonate. If ammonium carbonate used, particle size of resulting neutral compounds controlled to eliminate virtually any absorption into the lungs.

B86-10131

PHOSPHAZENE POLYMERS CONTAINING CARBORANE

L. L. FEWELL, J. A. PARKER, and R. J. BASI (San Jose State University)

May 1986

ARC-11487

Vol. 10, No. 2, P. 83

Addition of carborane increases thermal stability. Carborane-substituted polyphosphazenes prepared by thermal polymerization of phenylcarbonyl-pentachlorocyclophosphazene followed by reaction with sodium trifluoroethoxide to replace remaining chlorine atoms with trifluoroethoxy groups. Improved polymers offer high char yields and resistance to hydrolysis.

B86-10132

ROOM-TEMPERATURE DEPOSITION OF NBN SUPERCONDUCTING FILMS

S. THAKOOR (Caltech), J. L. LAMB (Caltech), A. P. THAKOOR (Caltech), and S. K. KHANNA (Caltech)

May 1986

NPO-16681

Vol. 10, No. 2, P. 84

Films with high superconducting transition temperatures deposited by reactive magnetron sputtering. Since deposition process does not involve significantly high substrate temperatures, employed to deposit counter electrode in superconductor/insulator/superconductor junction without causing any thermal or mechanical degradation of underlying delicate tunneling barrier. Substrates for room-temperature deposition of Nbn polymeric or coated with photoresist, making films accessible to conventional lithographic patterning techniques. Further refinements in deposition technique yield films with smaller transition widths, T_c of which might approach predicted value of 18 K.

B86-10133
INCREASING THE CRYOGENIC TOUGHNESS OF STEELS

H. F. RUSH

May 1986 See Also (N84-30014)

LAR-13376

Vol. 10, No. 2, P. 85

Grain-refining heat treatments increase toughness without substantial strength loss. Five alloys selected for study, all at or near technological limit. Results showed clearly grain sizes of these alloys refined by such heat treatments and grain refinement results in large improvement in toughness without substantial loss in strength. Best improvements seen in HP-9-4-20 Steel, at low-strength end of technological limit, and in Maraging 200, at high-strength end. These alloys, in grainrefined condition, considered for model applications in high Reynolds-number cryogenic wind tunnels.

B86-10134

IMPACT-RESISTANT CERAMIC COATING

W. H. WHEELER (Lockheed Missiles & Space Co.), J. F. CREEDON (Lockheed Missiles & Space Co.), and Y. D. IZU (Lockheed Missiles & Space Co.)

May 1986

MSC-20829

Vol. 10, No. 2, P. 86

Refractory fibers more than double strength of coating. Impact strengths of ceramic coatings increase with increasing whisker content. Silicon carbide whiskers clearly produce largest increase, and improvement grows even more with high-temperature sintering. Coating also improves thermal and mechanical properties of electromagnetic components, mirrors, furnace linings, and ceramic parts of advanced internal-combustion engines.

B86-10135

CARBON SHIELDS FOR INTERCALATED FIBER CONDUCTORS

B. A. BANKS, and J. A. WOOLLAM (University of Nebraska)

May 1986 See Also (N81-21129)

LEW-14063

Vol. 10, No. 2, P. 86

Stability in air increased by depositing amorphous carbon. Initially graphite fibers intercalated (insertion of atoms or molecules between graphite layers). Next, conductor coated with diamondlike amorphous carbon. Coating applied in same chamber as intercalation reaction or alternate depositchamber is used. Deposition of carbon accomplished by any number of techniques. Ion-beam sputter-deposition and RF plasma techniques have been used, but dc plasma and others work also. Potential uses include conductive epoxy composites, tether conductors, signal wire, and power cables.

B86-10136

PRODUCING LARGE-PARTICLE MONODISPERSE LATEXES

J. W. VANDERHOFF (Lehigh University)

May 1986

MFS-26026

Vol. 10, No. 2, P. 87

Chemical process produces latex particles of relatively large, uniform size for use as size standards for instrument calibration. Process, based on seeding of mixture by very small latex particles, yields particles measuring 2 to 30 micrometer or more in average size. Produces monodisperse latexes in which deviation from average size is less than 2 percent. Particles used directly, without tedious separation procedures for removing off-size particles.

B86-10137

PROCESS PRODUCES

LOW-SECONDARY-ELECTRON-EMISSION SURFACES

A. N. CURREN, K. A. JENSEN, and R. F. ROMAN

May 1986

LEW-14130

Vol. 10, No. 2, P. 88

Textured carbon layer applied to copper by sputtering. Carbon

surface characterized by dense, random array of needle-like spires or peaks that extend perpendicularly from local copper surface. Spires approximately 7 micrometers in height and spaced approximately 3 micrometers apart, on average. Copper substrate essentially completely covered by carbon layer, is tenacious and not damaged by vibration loadings representative of multistage depressed collector (MDC) applications. Process developed primarily to provide extremely low-secondary-electron-emission surface for copper for use as highefficiency electrodes in MDC's for microwave amplifier traveling-wave tubes (TWT's). Tubes widely used in space communications, aircraft, and terrestrial applications.

B86-10138

ANTISOILING COATINGS FOR SOLAR-ENERGY DEVICES

E. F. CUDDIHY (Caltech), and P. WILLIS (Springborn Laboratories)

May 1986

NPO-16552

Vol. 10, No. 2, P. 90

Fluorocarbons resist formation of adherent deposits. Promising coating materials reduce soiling of solar photovoltaic modules and possibly solar thermal collectors. Contaminating layers of various degrees of adherence form on surfaces of devices, partially blocking incident solar energy, reducing output power. Loose soil deposits during dry periods but washed off by rain. New coatings help prevent formation of more-adherent, chemically and physically bonded layers rain alone cannot wash away.

B86-10139

HEAT- AND RADIATION-RESISTANT LUBRICANTS FOR METALS

E. A. LAWTON (Caltech)

May 1986

NPO-16341

Vol. 10, No. 2, P. 92

Protective and lubricating coatings formed in situ. Orthophthalonitrile reacts with metal-surface asperities at high frictional temperatures to form lubricating films of metal phthalocyanine. Compounds also formed with hot metal fragments torn from asperities. Bearing surfaces better protected from scoring, and fragments rendered less harmful to base fluids. Lubricants useful as additives to oils and greases in gears, transmissions, motors, and other machines where rubbing loads between metal parts may be severe. Because of their low volatility and lack of requirement for air or moisture, lubricants also useful in vacuums.

B86-10140

FUNDAMENTALS OF ALLOY SOLIDIFICATION

F. HART

May 1986 See Also (N84-34589)

LEW-14229

Vol. 10, No. 2, P. 93

Potential benefits of microgravity processing discussed. Symposium held at Lewis Research Center in September of 1984 on subject of microgravity and some basic metallurgical factors involved in production of metals. General metallurgical areas of interest were metal solidification and processing. Five specific areas covered included undercooling of liquids, porosity, microstructure, solidification, and segregation. Theme of symposium: Possible benefits of microgravity processing and beneficial effects on industry processing. Information readily lends itself to inclusion in educational programs at college level.

B86-10141

COMPOSITE REFRACTORY FELT/CERAMIC MATERIAL

D. B. ERCEGOVIC, C. L. WALKER, and C. T. NORNGREN

May 1986 See Also (N84-14145)

LEW-14238

Vol. 10, No. 2, P. 93

Ceramic protective coatings on combustor liners adhere better. Report discloses results of recent combustor-liner research where thick yttria stabilized zirconia ceramic was plasma-sprayed on

BRUNSBOND substrates and exposed to nearly stoichiometric combustion. Combustor screening tests exposed 30 test specimens to nearly-stoichiometric flame temperatures of 3,450 degrees F (2,170 K) for 4 cycles. After completion of screening tests, all 30 specimens showed no visible evidence of discoloration or failure. There were no mudflat cracks, felt/ceramic, or backing/felt separations on any panels.

B86-10142**INTRAPLY HYBRID COMPOSITE DESIGN**

C. C. CHAMIS, and J. H. SINCLAIR

May 1986

LEW-14079

Vol. 10, No. 2, P. 94

Several theoretical approaches combined in program. Intraply hybrid composites investigated theoretically and experimentally at Lewis Research Center. Theories developed during investigations and corroborated by attendant experiments used to develop computer program identified as INHYD (Intraply Hybrid Composite Design). INHYD includes several composites micromechanics theories, intraply hybrid composite theories, and integrated hygrothermomechanical theory. Equations from theories used by program as appropriate for user's specific applications.

B86-10221**ETCHING SILICON FILMS WITH XENON DIFLUORIDE**

M. H. HECHT (Caltech)

May 1986

NPO-16527 NPO-16528

Vol. 10, No. 3, P. 62

Microscopic circuit structures prepared for probing. Xenon difluoride removes relatively large amounts of silicon from integrated circuit or solar-cell structures while leaving SiO₂, Si₃N₄, Al₂O₃, and other compounds intact. In Etching Apparatus, solid XeF₂ sublimated in vacuum, then allowed to flow over sample at controlled rate and pressure. Wafer etched from back to expose SiO₂ and Al layers for spectroscopic analysis of SiO₂/Al interface. Using XeF₂ technique, silicon wafer with oxide layer reduced in thickness from standard 300 micrometer to as little as 10 nanometer without adversely affecting oxide.

B86-10222**PREVENTING DELAMINATION OF SILVERIZED FEP FILMS**

L. DOMNIKOV (Hughes Aircraft Co.), J. MAY (Hughes Aircraft Co.), and R. GALLEGO (Hughes Aircraft Co.)

May 1986

MSC-20460

Vol. 10, No. 3, P. 64

Edge treatment inhibits attack by moisture. New technique prevents delamination by sealing edges where delamination starts. Samples of aluminum/FEP/silver laminate survive humidity tests and other environmental tests when edges of layers are covered by epoxy bead. Untreated laminates, in contrast, deteriorated seriously during such tests.

B86-10223**LIGHTWEIGHT CERAMIC INSULATION**

W. H. WHEELER (Lockheed Missiles & Space Co., Inc.), and J. F. CREEDON (Lockheed Missiles & Space Co., Inc.)

May 1986

MSC-20831

Vol. 10, No. 3, P. 65

Fiber burnout process yields low densities. Low density attained by process of sacrificial burnout. Graphite or carbon fibers mixed into slurry of silica, alumina, and boron-compound fibers in amounts ranging from 25 to 75 percent of total fiber content by weight. Mixture formed into blocks and dried. Blocks placed in kiln and heated to 1,600 degrees F (870 degrees C) for several hours. Graphite or carbon fibers slowly oxidize away, leaving voids and reducing block density. Finally, blocks heated to 2,350 degrees F (1,290 degrees C) for 90 minutes to bond remaining ceramic fibers

together. Developed for use on Space Shuttle and other spacecraft, rigid insulation machined to requisite shape and bonded in place.

B86-10224**TOUGHER ADDITION POLYIMIDES CONTAINING SILOXANE**

T. L. ST. CLAIR, and S. MAUDGAL

May 1986

LAR-13304

Vol. 10, No. 3, P. 65

Laminates show increased impact resistances and other desirable mechanical properties. Bismaleamic acid extended by reaction of diaminosiloxane with maleic anhydride in 1:1 molar ratio, followed by reaction with half this molar ratio of aromatic dianhydride. Bismaleamic acid also extended by reaction of diaminosiloxane with maleic anhydride in 1:2 molar ratio, followed by reaction with half this molar ratio of aromatic diamine (Michael-addition reaction). Impact resistances improved over those of unmodified bismaleimide, showing significant increase in toughness. Aromatic addition polyimides developed as both matrix and adhesive resins for applications on future aircraft and spacecraft.

B86-10225**FAST GLAZING OF ALUMINA/SILICA TILES**

J. F. CREEDON (Lockheed Missiles & Space Co., Inc.), E. R. GZOWSKI (Lockheed Missiles & Space Co., Inc.), and W. H. WHEELER (Lockheed Missiles & Space Co., Inc.)

May 1986

MSC-20976

Vol. 10, No. 3, P. 66

Technique for applying ceramic coating to fibrous silica/alumina insulation tiles prevents cracks and substantially reduces firing time. To reduce thermal stresses in tile being coated, high-temperature, shorttime firing schedule implemented. Such schedule allows coating to mature while substrate remains at relatively low temperature, reducing stress differential between coating and substrate. Technique used to repair tiles with damaged coatings and possibly used in heat-treating objects made of materials having different thermal-expansion coefficients.

B86-10226**A METHOD FOR CHARACTERIZING PMR-15 RESIN**

G. D. ROBERTS, and R. W. LAUVER

May 1986

LEW-14253

Vol. 10, No. 3, P. 67

Quantitative analysis technique based on reverse-phase, high-performance liquid chromatography (HPLC) and paired-ion chromatography (PIC) developed for PMR-15 resins. In reverse-phase HPLC experiment, polar solvent containing material to be analyzed passed through column packed with nonpolar substrate. Composition of PMR-15 Resin of 50 weight percent changes as resin ages at room temperature. Verification of proper resin formulation and analysis of changes in resin composition during storage important to manufacturers of PMR-15 polymer matrix composite parts. Technique especially suitable for commercial use by manufacturers of high-performance composite components.

B86-10227**REINFORCING THE SEPARATORS FOR LITHIUM/CARBON CELLS**

E. R. DU FRESNE (Caltech)

May 1986

NPO-16619

Vol. 10, No. 3, P. 70

Fabrication of lithium/carbon batteries simplified by attachment of perforated nickel-foil, graphite-cloth, or graphite-paper backings to glass-fiber separators. Both nickel and carbon backings appear viable. Because perforated nickel foil already manufactured by electroforming, no obstacle to creation of very thin, very porous nickel foil to serve as backing. Thicknesses of 20 micrometers with porosities above 50 percent practicable.

04 MATERIALS

B86-10228

MATERIAL FOR FAST CUTTING

A. PEREZ (Rockwell International Corp.)

May 1986

MFS-29130

Vol. 10, No. 3, P. 70

New material for cutting tools increases productivity of machining processes. Material, called Iscanite (or equivalent), based on silicon nitride contains more than 90 percent silicon. Combines impact resistance close to that of coated carbides with heat and wear resistance close to those of aluminum oxide ceramics. Material used for cutting on old or new machine tools and makes it possible to exploit fully power and speed of machine.

B86-10229

EFFECTS OF RADIATION ON COATINGS

F. L. BOUQUET (Caltech), V. F. HRIBAR (Caltech), and E. C. METZLER (Caltech)

May 1986

NPO-16533

Vol. 10, No. 3, P. 71

Tests help to insure reliability in hostile environment. Tests of radiation damage to materials used in outer coverings of spacecraft described in 25-page report. Materials exposed to ionizing radiation then examined for degradation of desirable mechanical, electrical, and optical properties. Experimental results and test methods applicable to aircraft, scientific instrumentation, and other equipment subject to ionizing radiation, electrostatic discharge, or both.

B86-10230

TESTS OF SOLAR-ARRAY ENCAPSULANTS

R. H. LIANG (Caltech), K. L. ODA (Caltech), S. Y. CHUNG (Caltech), M. V. SMITH (Caltech), and A. GUPTA (Caltech)

May 1986 See Also N83-33339/NSP

NPO-16387

Vol. 10, No. 3, P. 71

Materials tested for degradation by heat and light. Report presents early results of continuing series of photothermal aging tests of some candidate encapsulating materials for solar photovoltaic modules. Objectives of testing program: contribute to development of durable, low-cost encapsulants and predict lifetimes of encapsulated photovoltaic modules placed outdoors. Toward these ends, tests designed to reveal physical and chemical degradation mechanisms that affect encapsulants.

B86-10231

SEPARATION IN BINARY ALLOYS

D. O. FRAZIER, B. R. FACEMIRE, W. F. KAUHLER, W. K. WITHEROW, and U. FANNING

May 1986 See Also N84-24773/NSP

MFS-27074

Vol. 10, No. 3, P. 72

Studies of monotectic alloys and alloy analogs reviewed. Report surveys research on liquid/liquid and solid/liquid separation in binary monotectic alloys. Emphasizes separation processes in low gravity, such as in outer space or in free fall in drop towers. Advances in methods of controlling separation in experiments highlighted.

B86-10232

CRACK GROWTH IN SINGLE-CRYSTAL SILICON

C. P. CHEN (Caltech), and M. H. LEIPOLD (Caltech)

May 1986

NPO-16757

Vol. 10, No. 3, P. 73

Report describes experiments on crack growth in single-crystal silicon at room temperature in air. Crack growth in (111) cleavage plane of wafers, 50 by 100 by 0.76 mm in dimension, cut from Czochralski singlecrystal silicon studied by double-torsion load-relaxation method and by acoustic-emission measurements. Scanning electron microscopy and X-ray topography also employed.

Results aid in design and fabrication of silicon photovoltaic and microelectronic devices.

B86-10330

FIRE-RESISTANT POLYIMIDES CONTAINING PHOSPHORUS

J. MIKROYANNIDIS

Jul. 1986

ARC-11522

Vol. 10, No. 4, P. 64

Limiting oxygen index increased. Copolyimide with a group containing phosphorus synthesized from 1-2,4-diaminobenzene, m-phenylenediamine, and tetracarboxylic dianhydride. Copolymer more fire resistant than corresponding polyimide without phosphorus.

B86-10331

SULFONE/ESTER POLYMERS CONTAINING PENDENT ETHYNYL GROUPS

P. M. HERGENROTHER, and B. J. JENSEN

Jul. 1986

LAR-13316

Vol. 10, No. 4, P. 66

Two processes make high-performance polymers resistant to solvents, without compromising mechanical characteristics. Polymers show improved solvent resistance while retaining high toughness, thermoformability, and mechanical performance. Multistep process involves conversion of pendent bromo group to ethynyl group, while direct process involves reacting hydroxy-terminated sulfone oligomers or polymers with stoichiometric amount of 5-(4-ethynylphenoxy) isophthaloyl chloride. Applications for new polymers include adhesives, composite resin matrices, moldings, ultrafiltration membranes, protective coatings, and such electrical insulators as thin films for microelectronic circuitry.

B86-10332

POWDER EXTINGUISHANTS FOR JET-FUEL FIRES

R. L. ALTMAN, L. A. MAYER (San Jose University), and A. C. LING (San Jose University)

Jul. 1986

ARC-11252

Vol. 10, No. 4, P. 68

Mixtures of alkali metal dawsonite and metal halide show superior performance. In tests of new dry powder fire extinguishants, mixtures of potassium dawsonite with either stannous iodide or potassium iodide found effective for extinguishing jet-fuel fires on hot metal surfaces (up to 900 degrees C). Mixtures performed more effectively than either compound alone.

B86-10333

PROCESS FOR MAKING TRIS(N-METHYLAMINO) METHYLSILANE

J. M. CLEMONS, B. G. PENN, and FRANK E. LEDBETTER, III

Jul. 1986

MFS-28143

Vol. 10, No. 4, P. 69

Efficient process aids production of silicon carbide/silicon nitride fibers. Fibers 10 to the sixth power times as electrically resistive as carbon fibers having similar mechanical properties; promising replacements for carbon fibers in composite materials in which high conductivity poses hazard.

B86-10334

COMPOSITE LIGHTNING RODS FOR AIRCRAFT

CHARLES F. BRYAN, JR.

Jul. 1986

LAR-13470

Vol. 10, No. 4, P. 69

Composite, lightweight sacrificial tip with graphite designed reduces lightning-strike damage to composite parts of aircraft and dissipates harmful electrical energy. Device consists of slender composite rod fabricated from highly-conductive unidirectional

reinforcing fibers in matrix material. Rods strategically installed in trailing edges of aircraft wings, tails, winglets, control surfaces, and rearward-most portion of aft fuselage.

B86-10439**LIGHTWEIGHT, FIRE-RESISTANT GRAPHITE COMPOSITES**

D. A. KOURTIDES, J. A. PARKER, and MING-TA-HSU (H.C. Chemical Corp.)

Sep. 1986

ARC-11615

Vol. 10, No. 5, P. 74

Aircraft safety improved with interior paneling made of new laminate with good thermophysical properties. Featuring lightweight graphite composite, laminate more heat-and flame-resistant and produces much less smoke in fire than commonly used epoxy-resin-containing laminates. New laminate prepared without epoxy resin. Graphite unidirectional cloth preimpregnated with blend of vinyl polystyrylpyridine and bismaleimide (VPSP-BMI). Either of two types of VPSP-BMI blend used, depending on method of preparation of chemicals and technique used to fabricate panel.

B86-10440**ION-PLATED SOFT METALLIC FILMS REDUCE FRICTION AND WEAR**

T. SPALVINS

Sep. 1986 See Also N85-29085/NSP

LEW-14311

Vol. 10, No. 5, P. 78

Ion plating is ion-assisted or glow-discharge surface-deposition technique. In this process, ions or energetic atoms transfer energy, momentum, and charge to substrate and deposited surface film. Process controlled to modify physical characteristics of surface, subsurface chemical conditions, and surface and subsurface microstructures as well. Ion plating with such soft, thin metallic films as gold, silver, or lead has great potential for producing self-contained lubricating surfaces. Such films reduce friction, wear, and corrosion on sliding or rotating mechanical surfaces used in wide range of environments.

B86-10441**DETECTING PORES IN SIC COATINGS**

A. B. HAMILTON (LTV Aerospace and Defense), K. L. TUMMONS (LTV Aerospace and Defense), and J. W. LAWTON (LTV Aerospace and Defense)

Sep. 1986

MSC-21041

Vol. 10, No. 5, P. 78

Liquid-penetrant/fluorescence technique reveals cracks and pinholes in protective coatings. Developed for checking quality of overcoatings on silicon carbide layers on advanced carbon/carbon substrates. Technique similar to other liquid-penetrant/fluorescence techniques used to make pores visible. Porous areas absorb more suspension and therefore accumulate more fluorescent particles. They fluoresce more brightly than their surroundings.

B86-10442**CHEMICAL FRACTURING OF REFRACTORY-METAL VESSELS**

R. J. CAMPANA (GA Technologies Inc.)

Sep. 1986

NPO-16541

Vol. 10, No. 5, P. 80

Localized reactions cause refractory-metal vessels to break up at predetermined temperatures. Device following concept designed to break up along predetermined lines into smaller pieces at temperature significantly below melting point of metal from which made. Possible applications include fire extinguishers that breakup to release extinguishing gas in enclosed areas, pressure vessels that could otherwise burst dangerously in fire, and self-destroying devices. Technique particularly suitable modification to already existing structures.

B86-10443**ABRASION-RESISTANT COATING FOR FLEXIBLE INSULATION**

D. MUI (Rockwell International Corp.), and R. E. HEADDING (Rockwell International Corp.)

Sep. 1986

MSC-20799

Vol. 10, No. 5, P. 80

Ceramic coating increases durability and heat resistance of flexible high-temperature insulation. Coating compatible with quartz-fabric insulation allowing it to remain flexible during and after repeated exposures to temperatures of 1,800 degree F (982 degree C). Prevents fabric from becoming brittle while increasing resistance to aerodynamic abrasion and loading. Coating consists of penetrating precoat and topcoat. Major ingredients high-purity colloidal silica binder and ground silica filler, which ensure stability and compatibility with fabric at high temperatures. Both precoat and topcoat cured at room temperature.

B86-10444**POLYIMIDE OF MODIFIED MELT FLOW AND TOUGHNESS**

T. L. ST. CLAIR, and H. D. BURKS

Sep. 1986 See Also U.S. Patent No. 4,552,931

LAR-13135

Vol. 10, No. 5, P. 81

Linear aromatic polyphenylene ether sulfideimide (BDSDA/APB) polymer molded, used as resin, and cast into thin films. In effort to improve further both use properties and amenability to process BDSDA/APB, molecular weight of polymer varied by variations in percentage of end capping. Effect of end capping BDSDA/APB determined by measurement of polymer melt viscosity and fracture-energy values for different number average synthesized molecular weights.

B86-10445**BATCH GAS-SAMPLING SYSTEM**

VERNON DIAZ, JR. (Lockheed Engineering and Management Services Co., Inc.), E. L. MILLER (Lockheed Engineering and Management Services Co., Inc.), and F. P. ROLLINS (Lockheed Engineering and Management Services Co., Inc.)

Sep. 1986

MSC-20977

Vol. 10, No. 5, P. 82

Sampler collects air or other gases in consistent way and stabilizes them for later chemical analysis. Device used for concentrations ranging from few parts per million to 100 percent. Also separates and collects particles in gas for analysis. Gas flows into vacuum sphere when solenoid valve opened. As it passes through conversion tube, constituent of gas forms stable compound that remains in conversion tube for analysis at later time. Sampler parts made of glass, polytetrafluoroethylene, and stainless steel so they do not react with sample.

B86-10446**PRODUCING SILICON CARBIDE/SILICON NITRIDE FIBERS**

(Innovator Not Given)(Bjorksten Research Laboratory, Inc.)

Sep. 1986

MFS-27123

Vol. 10, No. 5, P. 82

Manufacturing process makes CxSi_yN_z fibers. Precursor fibers spun from extruding machine charged with polycarbosilazane resin. When pyrolyzed, resin converted to cross-linked mixture of silicon carbide and silicon nitride, still in fiber form. CxSi_yN_z fibers promising substitutes for carbon fibers in high-strength, low-weight composites where high electrical conductivity unwanted.

B86-10447**OXYGEN-CONCENTRATING CELL**

K. BUEHLER

Sep. 1986

KSC-11335

Vol. 10, No. 5, P. 83

High-purity oxygen produced from breathing air or from

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propellantgrade oxygen in oxygen-concentrating cell. Operating economics of concentrator attractive: Energy consumption about 4 Wh per liter of oxygen, slightly lower than conventional electrochemical oxygen extractors.

B86-10448

LUBRICANTS AND ADDITIVES AFFECT SPUR-GEAR FATIGUE

H. SCIBBE, D. TOWNSEND, P. ARON, and E. ZARETSKY
Sep. 1986 See Also N85-13234/NSP, N85-16099/NSP, N85-28373/NSP

LEW-14314

Vol. 10, No. 5, P. 84

Surface-fatigue tests conducted with AISI 9310 steel spur gears show surface-fatigue life of AISI 9310 steel spur gears increased as much as 400 percent by addition of small amount of phosphorus-type extreme-pressure (EP) additive in lubricant. Antiwear or EP additives either absorbed onto surface or react with surface to form protective coating or surface film. Boundary film provides barrier that prevents contact of metal surfaces and provides low shear strength, which reduces friction coefficient below base metal.

B86-10449

POLYIMIDE FILM OF INCREASED TEAR STRENGTH

A. K. ST. CLAIR, J. A. HINKLEY, and S. A. EZZELL (Virginia Polytechnic Institute and State University)

Sep. 1986

LAR-13491

Vol. 10, No. 5, P. 85

High-temperature linear aromatic polyimide with improved resistance to tearing made by new process that incorporates elastomer into polyimide. Linear aromatic condensation polyimides are materials of prime choice for use as films and coatings on advanced spacecraft and aircraft where durability at temperatures in range of 200 to 300 degree C required. Elastomer-containing polyimide film with improved toughness proves useful for applications where resistance to tearing and long-term thermal stability necessary. Desired resistance to tearing achieved by careful control of amount and chemical composition of added elastomer.

B86-10450

HIGH-TEMPERATURE ALLOYS FOR AUTOMOTIVE STIRLING ENGINES

J. R. STEPHENS, and R. H. TITRAN

Sep. 1986 See Also N84-28963/NSP

LEW-14325

Vol. 10, No. 5, P. 86

Stirling engine is external-combustion engine that offers fuel economy, low emissions, low noise, and low vibrations. One of most critical areas in engine development concerns material selection for component parts. Alloys CG-27 and XF-818 identified capable of withstanding rigorous requirements of automotive Stirling engine. Alloys chosen for availability, performance, and manufacturability. Advanced iron-base alloys have potential for variety of applications, including stationary solar-power systems.

B86-10451

RESPONSES OF DIELECTRICS TO SPACE RADIATION

F. L. BOUQUET (Caltech)

Sep. 1986

NPO-16687

Vol. 10, No. 5, P. 89

Nature, extent, and possible prevention of radiation damage discussed. Report summarizes likely effects of high-energy radiation in outer space on variety of commercially-available dielectric materials used in spacecraft. Effects reported on basis of recent Galileo tests, unpublished tests involving proton or electron irradiation, and published information. In general, organic materials with carbon or inorganic fillers most resistant to radiation.

B86-10452

THERMAL CONDUCTANCES OF PRESSED COPPER CONTACTS

L. SALERNO, P. KITTEL, and A. SPIVAK (Trans Bay Electronics)

Sep. 1986

ARC-11572

Vol. 10, No. 5, P. 89

Report describes investigation of thermal conductivities of smooth copper contacts pressed together at liquid-helium temperatures. Investigation prompted by need for accurate thermal models for infrared detectors and other cryogenic instruments.

B86-10492

HOSE- AND TUBE-CLEANING MODULE

F. P. ROLLINS (Lockheed-EMSCO), and J. S. GLASS (Lockheed-EMSCO)

Nov. 1986

MSC-20857

Vol. 10, No. 6, P. 46

Self-contained, single-use module enables hose or tube to be cleaned thoroughly in field, in one operation, using water of unknown or questionable quality. Previously, chemicals for flow cleaning had to be mixed, diluted and pumped through tubes and hoses in many successive steps; deionizers, water-treatment facilities, and chemical storage required. With proposed device cleaning performed safely, without special training. Ready to use, device packaged as cleaning kit with tube to be cleaned.

B86-10493

FIRE-RESISTANT BELT PANEL FOR AIRPLANE WINDOWS

E. L. TRABOLD (McDonnell Douglas Corp.), and M. F. MURPHY (McDonnell Douglas Corp.)

Nov. 1986

MSC-21064

Vol. 10, No. 6, P. 48

Window-belt panel for airplanes fire resistant and generates little smoke when exposed to flames. Panel incorporates fire-shield layer adding minimal weight but delays or prevents fire from burning through. Structural core of panel is Nomex or equivalent polyamide paper honeycomb. Fire shield, made of fluororubber sheet, incorporated in multiple-ply facing bonded to core. Outer layers of multiple-ply facing and back face of panel consist of biwoven carbon-cloth impregnated with phenolic resin.

B86-10494

FIRE-RESISTANT AIRCRAFT CEILINGS

E. A. TRABOLD (McDonnell Douglas Corp.), and M. F. MURPHY (McDonnell Douglas Corp.)

Nov. 1986

MSC-21065

Vol. 10, No. 6, P. 48

Ceiling panel for airplane cabins more fire resistant than conventional panels. New panel incorporates core of polyimide foam as fire shield. Core significantly delays burn-through by flames and offers passengers greater protection.

B86-10495

TWO-STEP VAPOR/LIQUID/SOLID PURIFICATION

L. R. HOLLAND (University of Alabama, Huntsville)

Nov. 1986

MFS-26004

Vol. 10, No. 6, P. 51

Vertical distillation system combines in single operation advantages of multiple zone refining with those of distillation. Developed specifically to load Bridgman-Stockbarger (vertical-solidification) growth ampoules with ultrapure tellurium and cadmium, system, with suitable modifications, serves as material refiner. In first phase of purification process, ampoule heated to drive off absorbed volatiles. Second phase, evaporator heated to drive off volatiles in charge. Third phase, slowly descending heater causes distillation from evaporator to growing crystal in ampoule.

B86-10496**STRONG ADHESIVE TAPE FOR COLD ENVIRONMENTS**

T. G. WOODS (McDonnell Douglas Corp.)

Nov. 1986

MSC-20924**Vol. 10, No. 6, P. 52**

Strong tape remains sticky over wide temperature range. Strong tape for low temperatures consists of two layers of polyimide tape with layer of reinforcing mesh. Improved tape devised for repairs in space also finds use on Earth in polar regions and in superconducting applications. Tape retains adherence and strength at extreme temperatures, where conventional tapes fail.

B86-10497**FUEL MANIFOLD RESISTS EMBRITTLEMENT BY HYDROGEN**

T. ADAMS (Rockwell International Corp.)

Nov. 1986

MFS-29089**Vol. 10, No. 6, P. 54**

Completely-cast hydrogen-compatible alloy preferable to protective plating. Complexity of plating, welding, and brazing unnecessary if hydrogen-compatible alloy used for entire casting instead of protective overlay. Parts exposed to high-pressure hydrogen made immune to hydrogen embrittlement if fabricated from new alloy, Incoly 903 (or equivalent). Material strong and compatible with hydrogen at all temperatures and adapted for outlet manifold of Space Shuttle main combustion chamber.

B86-10498**IRON/PHOSPHORUS ALLOYS FOR CONTINUOUS CASTING**

E. R. DUFRESNE (Caltech)

Nov. 1986

NPO-16611**Vol. 10, No. 6, P. 54**

Continuous casting becomes practicable because of reduced eutectic temperature. Experimental ferrous alloy has melting point about 350 degrees C lower than conventional steels, making possible to cast structural members and eliminating need for hot rolling. Product has normal metal structure and good physical properties. Process used to make rails, beams, slabs, channels, and pipes.

B86-10499**POLYETHER/POLYESTER GRAFT COPOLYMERS**

VERNON L. BELL, JR., N. WAKELYN, D. M. STOAKLEY, and K. M. PROCTOR

Nov. 1986

LAR-13447**Vol. 10, No. 6, P. 55**

Higher solvent resistance achieved along with lower melting temperature. New technique provides method of preparing copolymers with polypivalolactone segments grafted onto poly (2,6-dimethyl-phenylene oxide) backbone. Process makes strong materials with improved solvent resistance and crystalline, thermally-reversible crosslinks. Resulting graft copolymers easier to fabricate into useful articles, including thin films, sheets, fibers, foams, laminates, and moldings.

B86-10500**LOW-RESISTIVITY ZINC SELENIDE FOR HETEROJUNCTIONS**

R. J. STIRN (Caltech)

Nov. 1986

NPO-16475**Vol. 10, No. 6, P. 56**

Magnetron reactive sputtering enables doping of this semiconductor. Proposed method of reactive sputtering combined with doping shows potential for yielding low-resistivity zinc selenide films. Zinc selenide attractive material for forming heterojunctions with other semiconductor compounds as zinc phosphide, cadmium telluride, and gallium arsenide. Semiconductor junctions promising for future optoelectronic devices, including solar cells and electroluminescent displays. Resistivities of zinc selenide layers

deposited by evaporation or chemical vapor deposition too high to form practical heterojunctions.

B86-10501**CHEMICAL CHARACTERIZATION OF PHENOL/FORMALDEHYDE RESINS**

T. H. BRAYDEN (LTV Aerospace and Defense Co.)

Nov. 1986

MSC-21055**Vol. 10, No. 6, P. 59**

Report discusses tests of commercial phenol/formaldehyde resins to establish relationships among composition before use, behavior during curing, and strength after curing. Resin used in carbon/carbon laminates. In curing process, two molecules of phenol joined together in sequence of reactions involving molecule of formaldehyde. Last step of sequence, molecule of water released. Sequence repeats until one of ingredients used up, leaving solidified thermoset plastic. Issues to be resolved: number and relative abundances of ingredients, presence of certain chemical groups, heat-producing ability of resin, and range of molecular weights present.

B87-10012**RAPID SYNTHESIS OF NONSTOICHIOMETRIC LANTHANUM SULFIDE**

S. MATSUDA (Thermo Electron Corp.), E. SHAPIRO (Thermo Electron Corp.), L. DANIELSON (Thermo Electron Corp.), and H. HARDISTER (Thermo Electron Corp.)

Jan. 1987

NPO-16631**Vol. 11, No. 1, P. 40**

New process relatively fast and simple. Improved method of synthesizing nonstoichiometric lanthanum sulfide faster and simpler. Product purer because some of prior sources of contamination eliminated.

B87-10013**FIRE-RETARDANT, DECORATIVE INKS**

D. KOURTIDES, Z. NIR, and J. MIKROYANNIDIS (University of Patras)

Jan. 1987

ARC-11499**Vol. 11, No. 1, P. 40**

Effectiveness of fire-retardant additives evaluated. Fire retardance of decorative acrylic printing inks for aircraft interiors enhanced by certain commercial and experimental fire-retardant additives, according to study.

B87-10014**RADIATION EFFECTS ON POLYMER PROPERTIES**

F. L. BOUQUET (Caltech), and J. W. WINSLOW (Caltech)

Jan. 1987

NPO-16426**Vol. 11, No. 1, P. 41**

Report compiles data on effects of radiation on physical properties of synthetic organic materials. Emphasis on materials of interest to nuclear-equipment and nuclear-reactor designers. Data covers five categories of polymeric materials: Insulators, elastomeric seals and gaskets, lubricants, adhesives, and coatings. More than 250 materials represented.

B87-10015**EFFECTS OF RADIATION ON CAPACITOR DIELECTRICS**

F. L. BOUQUET (Caltech), R. B. SOMOANO (Caltech), and P. O. FRICKLAND (Caltech)

Jan. 1987

NPO-16761**Vol. 11, No. 1, P. 41**

Data gathered on key design parameters. Report discusses study of electrical and mechanical properties of irradiated polymer dielectric materials. Data compiled for use by designers of high-energy-density capacitors that operate in presence of ionizing radiation. Study focused on polycarbonates, polyetheretherketones,

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polymethylpentenes, polyimides (including polyetherimide), polyolefins, polysulfones (including polyethersulfone and polyphenylsulfone), and polyvinylidene fluorides.

B87-10016

SCREENING MECHANICALLY-DEFECTIVE SOLAR CELLS

C. P. CHEN (Caltech), and M. H. LEIPOLD (Caltech)

Jan. 1987

NPO-16573

Vol. 11, No. 1, P. 41

Flexure test eliminates failure-prone wafers before further processing. Probability of cracking of silicon solar cells substantially reduced by mechanical proof testing of silicon wafers before further processing, according to report. Report based on study demonstrating weak wafers eliminated by subjecting all wafers in manufacturing batch to biaxial-flexure test.

B87-10017

THERMOELECTRIC PROPERTIES OF LANTHANUM SULFIDE

C. WOOD (Caltech), R. LOCKWOOD (Caltech), J. B. PARKER (Caltech), A. ZOLTAN (Caltech), L. D. ZOLTAN (Caltech), L. DANIELSON (Caltech), and V. RAAG (Caltech)

Jan. 1987

NPO-16662

Vol. 11, No. 1, P. 42

Report describes measurement of Seebeck coefficient, electrical resistivity, thermal conductivity, and Hall effect in gamma-phase lanthanum sulfide with composition of $\text{La}_{3-x}\text{S}_4$. Results of study, part of search for high-temperature thermoelectric energy-conversion materials, indicate this sulfide behaves like extrinsic semiconductor over temperature range of 300 to 1,400 K, with degenerate carrier concentration controlled by stoichiometric ratio of La to S.

B87-10018

EVALUATION OF GAAS FRACTURE MECHANICS

C. P. CHEN (Caltech)

Jan. 1987

NPO-16604

Vol. 11, No. 1, P. 42

Report provides data on fracture properties of single-crystal GaAs. Data required for design of reliable GaAs solar cells and modules. Aids design of solar cells.

B87-10019

MICROSTRUCTURE AND AGING OF POWDER-METALLURGY AL ALLOYS

L. B. BLACKBURN

Jan. 1987

LAR-13298

Vol. 11, No. 1, P. 43

Report describes experimental study of thermal responses and aging behaviors of three new aluminum alloys. Alloys produced from rapidly solidified powders and contain 3.20 to 5.15 percent copper, 0.24 to 1.73 percent magnesium, 0.08 to 0.92 percent iron, and smaller amounts of manganese, nickel, titanium, silicon, and zinc. Peak hardness achieved at lower aging temperatures than with standard ingot-metallurgy alloys. Alloys of interest for automobile, aircraft, and aerospace applications.

B87-10067

POLYIMIDE PREPREGS WITH IMPROVED TACK

R. VANUCCI

Feb. 1987 See Also N83-12175/NSP and N72-29598/NSP

LEW-14198

Vol. 11, No. 2, P. 40

Drape and tack improved without loss of strength. Composites made with PMR-15 (or equivalent) polyimides have gained acceptance as viable engineering materials for high-use-temperature applications. Acceptance due to both thermo-oxidative stability of PMR-15 (or equivalent) and ease which

PMR-15 (or equivalent) prepreg materials processed into composite structures.

B87-10068

NEGATIVE-ELECTRODE CATALYSTS FOR FE/CR REDOX CELLS

R. F. GAHN, and N. HAGEDORN

Feb. 1987 See Also N85-27387/NSP

LEW-14028

Vol. 11, No. 2, P. 42

Electrodes perform more consistently and less expensive. Surfaces catalyzed by bismuth and bismuth/lead developed for application on chromium electrode in iron/chromium redox electrochemical energy storage system. NASA Fe/Cr storage system incorporates two soluble electrodes consisting of acidified solutions of iron chloride (FeCl_3 and FeCl_2) and chromium chloride (CrCl_3 and CrCl_2) oxidized and reduced in power-conversion unit to store and produce electricity. Electrolytes circulated with pumps and stored in external tanks.

B87-10069

DESULFURIZING COAL WITH AN ALKALI TREATMENT

M. RAVINDRAM (Caltech), and J. J. KALVINSKAS (Caltech)

Feb. 1987

NPO-16366

Vol. 11, No. 2, P. 43

Experimental coal-desulfurization process uses alkalis and steam in fluidized-bed reactor. With highly volatile, high-sulfur bituminous coal, process removed 98 percent of pyritic sulfur and 47 percent of organic sulfur. Used in coal liquefaction and in production of clean solid fuels and synthetic liquid fuels. Nitrogen or steam flows through bed of coal in reactor. Alkalies react with sulfur, removing it from coal. Nitrogen flow fluidizes bed while heating or cooling; steam is fluidizing medium during reaction.

B87-10070

SEMI-INTERPENETRATING POLYMER NETWORKS

T. L. ST. CLAIR, and A. O. EGLI (PRC Kentron, Inc.)

Feb. 1987

LAR-13450

Vol. 11, No. 2, P. 44

Desirable qualities achieved by 'networking' aromatic and addition polyimides. Novel semi-interpenetrating network (semi-ipn) prepared from two types of polyimides. Semi-ipn results when linear polymer synthesized in presence of cross-linked polymer or vice-versa. Semi-ipn attains certain properties better than those of either polymer alone.

B87-10071

NOBLE METALS WOULD PREVENT HYDROGEN EMBRITTLEMENT

N. E. PATON (Rockwell International Corp.), and J. D. FRANDSEN (Rockwell International Corp.)

Feb. 1987

MFS-29114

Vol. 11, No. 2, P. 45

According to proposal, addition of small amounts of noble metals makes iron- and nickel-based alloys less susceptible to embrittlement by hydrogen. Metallurgists demonstrated adding 0.6 to 1.0 percent by weight of Pd or Pt eliminates stress/corrosion cracking in type 4130 steel. Proposal based on assumption that similar levels (0.5 to 1.0 weight percent) of same elements effective against hydrogen embrittlement.

B87-10072

PROGRESS TOWARD MONOLITHIC PERITECTIC SOLIDIFICATION

DAVID J. LARSON, JR. (Grumman Aerospace Corp.), WILLIAM POIT, JR. (Grumman Aerospace Corp.), and R. G. PIRICH (Grumman Aerospace Corp.)

Feb. 1987

MFS-28079

Vol. 11, No. 2, P. 45

Reducing convection during plane-front, two-phase peritectic solidification reduces banding. Experiments show reducing radial thermal gradients and flattening solidification interface reduces compositional banding associated with plane-front, two-phase peritectic solidification. Possibility of coupled two-phase peritectic composite solidification still exists. Previously thought banding was inevitable.

B87-10073

FLEXURAL PROPERTIES OF ARAMID-REINFORCED PULTRUSIONS

M. L. WILSON, G. S. JOHNSON, and I. O. MACCONOCHIE
Feb. 1987

LAR-13442

Vol. 11, No. 2, P. 46

Four resin systems show improved properties after postcuring. Comparison of flexural properties made of pultrusions reinforced by Kevlar (or equivalent) aromatic polyamide and having constant fiber volume and varied matrices, pretreatments, and postcures. Objective of study to improve flexural properties of pultrusion reinforced with Kevlar (or equivalent). Advantages of using pultrusion process, over conventional hand-layup methods included higher production rates, low facility and labor requirements, and reduced manufacturing costs of advanced composites.

B87-10074

HIGH-STRENGTH GLASS FOR SOLAR APPLICATIONS

F. L. BOUQUET (Caltech)
Feb. 1987

NPO-16536

Vol. 11, No. 2, P. 48

Technology for strengthening thin sections reviewed. Report reviews technology of high-strength glass for such solar applications as heat collectors, reflectors, and photovoltaic arrays. Discusses most feasible methods - heat strengthening and chemical strengthening of increasing strength of glass for solar-energy use. Also estimates cost and availability of high-strength glass and considers physical characteristics, amenability to back-silvering, and effects of atmospheric contamination.

B87-10075

TRANSPARENT ANALOGS FOR ALLOY PHASE STUDIES

D. O. FRAZIER, and JAMES E. SMITH, JR. (University of Alabama)
Feb. 1987

MFS-27109

Vol. 11, No. 2, P. 48

Report describes experiments to add information to data base supporting use of transparent, partially miscible liquids and solids as analogs in studies of alloy solidification. Behavior of these materials observed directly while they undergo liquid/liquid and liquid/solid phase transformations. Light-scattering techniques used to determine phase boundaries. Transparent analogs allow observation of both solidification patterns and processes leading to those patterns, whereas metal alloys require tedious post-solidification metallographic analyses because processes not generally observed. Experiments with transparent substances safer and cheaper since conducted at much lower temperatures.

B87-10076

COMPUTER SIMULATION OF ABLATOR CHARRING

C. W. STROUD, L. M. HOWSER, and K. L. BRINKLEY
Feb. 1987

LAR-13502

Vol. 11, No. 2, P. 56

Transient response of thermal-protection material to heat applied to surface calculated using CHAP III computer program. Used to analyze chemical kinetics of pyrolysis gas in detail and examine pyrolysis reactions-in-depth. Analysis includes deposition of solid products produced by chemical reactions in gas phase.

Uses modeling technique that approximates wide range of ablation problems. CHAP III written in FORTRAN IV.

B87-10119

NEW POLYMERIC PRECURSORS OF SILICON CARBIDE

M. LITT (Case Western University), and K. KUMAR (Case Western University)
Mar. 1987

LEW-14272

Vol. 11, No. 3, P. 34

Silicon carbide made by pyrolyzing polymers. Method conceived for preparation of poly(decamethylcyclotrioxasilanes) as precursors for preparation of silicon carbide at high yield. Technical potential of polysilanes as precursors of SiC ceramics being explored. Potential limited by intractability of some polysilanes; formation of small, cyclic polycarbosilane fragments during pyrolysis; and overall low char yield and large shrinkage in conversion to ceramics.

B87-10120

CONCEPT FOR UNDERGROUND DISPOSAL OF NUCLEAR WASTE

J. M. BOWYER (Caltech)
Mar. 1987

NPO-16042

Vol. 11, No. 3, P. 34

Packaged waste placed in empty oil-shale mines. Concept for disposal of nuclear waste economically synergistic with earlier proposal concerning backfilling of oil-shale mines. New disposal concept superior to earlier schemes for disposal in hard-rock and salt mines because less uncertainty about ability of oil-shale mine to contain waste safely for millenium.

B87-10121

ELECTRICALLY CONDUCTIVE, HEAT-RESISTANT PAINT

V. F. HRIBAR (Caltech), and R. J. MELL (Caltech)
Mar. 1987

NPO-16325

Vol. 11, No. 3, P. 36

Improved, sprayable, thermal- and electrostatic-discharge-control coating for titanium possesses excellent adhesion and high resistance to both vibration and thermal shock. Coating is improved formulation of one described in 'High-Temperature Coatings for Titanium' (NPO-16222).

B87-10122

LONG-TERM TESTS OF 38 BALL-BEARING GREASES

E. MCMURTREY

Mar. 1987 See Also N85-11239/NSP

MFS-27089

Vol. 11, No. 3, P. 36

Perfluoroalkylpolyether lubricants performed best. Final report in series presents results of program of long-term testing of ballbearing greases in vacuum, oxidizing, and otherwise hostile environments. Earlier reports in same series described in 'Tests of 38 Ball-Bearing Greases,' (MFS-25624) and 'Further Tests of 38 Ball-Bearing Greases,' (MFS-27043)

B87-10123

AMORPHOUS-METAL-FILM DIFFUSION BARRIERS

M. A. NICOLET (Caltech)
Mar. 1987

NPO-16637

Vol. 11, No. 3, P. 38

Incorporation of N into Ni/W films reduces reactivity with Si substrate. Paper describes reactions between Si substrates and deposited amorphous Ni/W or Ni/N/W films. Thermal stability of amorphous Ni/W films as diffusion barriers in Si markedly improved by introduction of N into Ni/W films during deposition.

B87-10124
HIGH-TEMPERATURE THERMOELECTRIC ENERGY CONVERSION

C. WOOD (Caltech)

Mar. 1987

NPO-16548 Vol. 11, No. 3, P. 39

Theory of thermoelectric energy conversion at high temperatures and status of research on conversion materials reviewed in report. Shows highest values of thermoelectric figure of merit, Z, found in semiconductor materials. Semiconductors keep wide choice of elements and compounds. Electrical properties tailored to particular application by impurity doping and control of stoichiometry. Report develops definition of Z useful for comparing materials and uses it to evaluate potentials of different classes of materials: metals, semiconductors, and insulators.

B87-10125
EVALUATION OF FIBER-REINFORCED COMPOSITES

RAYMOND G. CLINTON, JR. (Georgia Institute of Technology)

Mar. 1987

MFS-27149 Vol. 11, No. 3, P. 39

Report describes procedures for evaluating properties of advanced fiber-reinforced composite materials. Procedures include quality control, fabrication techniques, specimen machining, test methods, and data collection and interpretation. Applied to specific material: Thornel P-100 carbon fiber combined with Fiberite 934 epoxy resin in form of unidirectional tape.

B87-10174
POLYENAMINES FOR FILMS, COATINGS, AND ADHESIVES

PAUL M. HERGENROTHER (Langley Research Center), ROBERT G. BASS (Virginia Commonwealth University), MARK S. SINSKY (Virginia Commonwealth University), and JOHN W. CONNELL (Virginia Commonwealth University)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13444 Vol. 11, No. 4, P. 34

Easy process makes polymers with good mechanical properties. Synthesis involves Michael-type addition polymerization of two diacetylenic diketones, with various aromatic diamines in m-cresol at 60 to 130 degrees C. Technique provides synthetic route to high-molecular-weight polyenamines with moderate thermal stability and good mechanical properties. Polyenamines produced exhibit potential for use as films, coatings, adhesives, molding compounds, and composite matrices.

B87-10175
CROSS-LINKING AROMATIC POLYMERS WITH IONIZING RADIATION

VERNON L. BELL (Langley Research Center), and STEPHEN J. HAVENS (PRC Kentron, Inc.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13448 Vol. 11, No. 4, P. 35

Resistance to heat and solvents increased. Certain aromatic polymers containing radiation-sensitive methylene groups cross-linked through methylene groups upon exposure to ionizing radiation. Cross-linked polymers resistant to most organic solvents and generally more resistant to high temperatures, with less tendency to creep under load. No significant embrittlement of parts fabricated from these polymers when degree of cross-linking, as controlled by irradiation dose, kept at moderate level.

B87-10176
OXYGEN-BARRIER COATING FOR TITANIUM

RONALD K. CLARK (Langley Research Center), and JALALIAH

UNNAM (Analytical Services & Materials, Inc.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13474 Vol. 11, No. 4, P. 39

Oxygen-barrier coating for titanium developed to provide effective and low-cost means for protecting titanium alloys from oxygen in environment when alloys used in high-temperature mechanical or structural applications. Provides protective surface layer, which reduces extent of surface oxidation of alloy and forms barrier to diffusion of oxygen, limiting contamination of substrate alloy by oxygen. Consists of submicron layer of aluminum deposited on surface of titanium by electron-beam evaporation, with submicron layer of dioxide sputtered onto aluminum to form coat.

B87-10177
PROCESSING CONJUGATED-DIENE-CONTAINING POLYMERS

VERNON L. BELL (Langley Research Center), and STEPHEN J. HAVENS (PRC Kentron Inc.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13452 Vol. 11, No. 4, P. 39

Diels-Alder reaction used to cross-linked thermoplastics. Process uses Diels-Alder reaction to cross-link and/or extend conjugated-diene-containing polymers by reacting them with bis-unsaturated dienophiles results in improved polymer properties. Quantities of diene groups required for cross-linking varies from very low to very high concentrations. Process also used to extend, or build up molecular weights of, low-molecular-weight linear polymers with terminal conjugated dienic groups.

B87-10178
COLORLESS POLYIMIDE FILMS FOR THERMAL-CONTROL COATINGS

ANNE K. ST. CLAIR (Langley Research Center), WAYNE S. SLEMP (Langley Research Center), ROBERT M. ELY (Langley Research Center), and ROBERT M. STEWART (Langley Research Center)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13539 Vol. 11, No. 4, P. 41

Series of six essentially colorless aromatic polyimide films synthesized and characterized with objective of obtaining maximum optical transparency for applications in space; optical transparency requirement for high-performance polymeric films used in second-surface mirror coatings on thermal-control systems. Films remain more transparent than commercial film after ultraviolet and electron irradiation. Increased transparency and enhanced solubility of optically transparent polyimides makes them viable candidates for use in thermal-control coatings.

B87-10179
ELASTOMER COMPATIBLE WITH OXYGEN

JON W. MARTIN (TRW Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28129 Vol. 11, No. 4, P. 41

Artificial rubber resists ignition on impact and seals at low temperatures. Filled fluoroelastomer called 'Katiflex' developed for use in seals of vessels holding cold liquid and gaseous oxygen. New material more compatible with liquid oxygen than polytetrafluoroethylene. Provides dynamic seal at -196 degrees C with only 4 times seal stress required at room temperature. In contrast, conventional rubber seals burn or explode on impact in high-pressure oxygen, and turn hard or even brittle at liquid-oxygen temperatures, do not seal reliably, also see (MFS-28124).

B87-10180**ELASTOMERS COMPATIBLE WITH HIGH-PRESSURE OXYGEN**
JON W. MARTIN (TRW Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28124**Vol. 11, No. 4, P. 42**

Compatibility increased by fluorination. Report describes experiments aimed at improving compatibility of some fluorinated elastomers with high-pressure oxygen. Such elastomers needed for seals, gaskets, and positive-expulsion devices used with high-pressure oxygen. Oxygen - compatibility tests carried out on five elastomers chosen on the basis of literature survey.

B87-10181**AIRCRAFT SEAT CUSHION FIRE-BLOCKING LAYERS**

KENNETH J. SCHUTTER (McDonnell Douglas Corp.), FRED E. DUSKIN (McDonnell Douglas Corp.), and EDWARD L. TRABOLD (McDonnell Douglas Corp.)

Apr. 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEI: 703-487-4650) (N83-11097/NSP)

ARC-11494**Vol. 11, No. 4, P. 42**

229-page report describes work done to determine burning characteristics of present and proposed seat-cushion materials and types of construction. Tested cushions classified in four groups: standard cushion construction, standard cushion construction with protective covering enveloping urethane-foam core, standard cushion construction with protective covering enveloping non-fire-retarded urethane-foam core, and standard cushion construction with urethane-foam core replaced by advanced fire-resistant foam. Report includes still photographs and presents quantitative data from each test in graphs and tables.

B87-10182**CERAMIC PARTS FOR TURBINES**

R. D. JONES (Rockwell International Corp.), HARRY W. CARPENTER (Rockwell International Corp.), JIM TELLIER (Rockwell International Corp.), CLARK ROLLINS (Rockwell International Corp.), and JERRY STORMO (Rockwell International Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27081**Vol. 11, No. 4, P. 42**

Abilities of ceramics to serve as turbine blades, stator vanes, and other elements in hot-gas flow of rocket engines discussed in report. Ceramics prime candidates, because of resistance to heat, low density, and tolerance of hostile environments. Ceramics considered in report are silicon nitride, silicon carbide, and new generation of such ceramic composites as transformation-toughened zirconia and alumina and particulate-or whisker-reinforced matrices. Report predicts properly designed ceramic components viable in advanced high-temperature rocket engines and recommends future work.

B87-10183**EFFECTS OF MONATOMIC OXYGEN ON COATINGS**

ANN WHITAKER (Marshall Space Flight Center), SALLY A. LITTLE (Marshall Space Flight Center), ROGER HARWELL (Marshall Space Flight Center), JACK SMITH (Marshall Space Flight Center), and ED WHITE (Marshall Space Flight Center)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28084**Vol. 11, No. 4, P. 43**

Report describes tests in which paints, metals, and optical materials carried in orbit around Earth determined how monatomic oxygen in rare orbital atmosphere affects them. Specimen disks carried aloft on Space Shuttle and exposed for 41.17 h at altitude of 120 nmi (222 km).

B87-10184**GROWTH OF METASTABLE PERITECTIC ALLOYS**

DAVID J. LARSON, JR. (Grumman Aerospace Corp.), and RONALD G. PIRICH (Grumman Aerospace Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27091**Vol. 11, No. 4, P. 44**

Effects of directional solidification on microstructural, compositional, and magnetic properties studied. Two reports describe experiments to determine effects of directional solidification on peritectic alloys. Of particular interest were effects of gravitationally driven convection.

B87-10224**CATALYTIC LAYER MAKES AIRCRAFT SEATS MORE FIRE RETARDANT**

JOHN A. PARKER, and DEMETRIUS A. KOURTIDES

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11423**Vol. 11, No. 5, P. 36**

Specially constructed cushion retards fires in aircraft seats through action of catalytic matrix that cracks flammable gaseous decomposition products to less flammable species. Improved cushion contributes substantially to fire safety without adding significantly to weight or to manufacturing cost. In this fire-blocking covering for an aircraft seat cushion, flammable pyrolysis products cracked to less flammable species by catalytic layer covering foam core of cushion. Aluminum foil holds in pyrolysis vapors to promote catalysis and prevent spread of fire by ignition of released vapors.

B87-10225**MAKING A SILICON-NITRIDE/SILICON-CARBIDE COMPOSITE**

R. T. BHATT

May 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEI: 703-487-4650) (N85-34223/NSP)

LEW-14392**Vol. 11, No. 5, P. 37**

Hot pressing and nitriding produce strong fiber/matrix material. Fabrication method developed for processing strong and tough silicon-based ceramic composite material, SiC/RBSN, which consists of reaction-bonded Si₃N₄ (RBSN) reinforced by continuous-length, high-modulus, high strength silicon carbide (SiC) fibers prepared by chemical-vapor deposition method. Increased toughness and ultimate strength of SiC/RBSN composite makes it potential structural material for advanced heat engines.

B87-10226**CORROSION OF SiC BY MOLTEN SALT**

NATHAN S. JACOBSON, and JAMES L. SMIALEK

May 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEI: 703-487-4650) (N85-30011/NSP and N85-30135/NSP)

LEW-14381**Vol. 11, No. 5, P. 38**

Advanced ceramic materials considered for wide range of applications as in gas turbine engines and heat exchangers. In such applications, materials may be in corrosive environments that include molten salts. Very corrosive to alloys. In order to determine extent of problem for ceramic materials, corrosion of SiC by molten salts studied in both jet fuel burners and laboratory furnaces. Surface of silicon carbide corroded by exposure to flame seeded with 4 parts per million of sodium. Strength of silicon carbide decreased by corrosion in flame and tube-furnace tests.

B87-10227**REUSABLE HIGH-TEMPERATURE/CRYOGENIC FOAM-INSULATION SYSTEM**

RANDALL C. DAVIS, ALLAN H. TAYLOR, L. ROBERT JACKSON,

04 MATERIALS

and PATRICK MCAULIFFE (Lockheed Aircraft Co.)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13506 Vol. 11, No. 5, P. 39

Flightweight insulation withstands wide temperature cycling. Reusable insulation system for cryogenic containment vessels withstands repeated exposures to thermal environments that span ranges from cryogenic-fluid temperature -425oF (-254oC) to maximum use temperature of containment-tank material +400oF (+204oC). System designed for use with high-speed flight vehicles.

B87-10228

FIRE- AND HEAT-RESISTANT LAMINATING RESINS

DEMETRIUS A. KOURTIDES, and JOHN A. MIKROYANNIDIS

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11533 Vol. 11, No. 5, P. 40

Imide compounds containing phosphorus thermally polymerized. New maleimido- or citraconimido-end-capped monomers, have relatively low melting temperatures, polymerized at moderate temperatures to rigid bisimide resins without elimination of volatiles. Monomers dissolve in such solvents as methyl ethyl ketone, acetone, and tetrahydrofuran, suitable and preferred as 'varnish solvents' for composite fabrication. Low melting points of these compounds allow use as adhesives without addition of solvents.

B87-10229

STATISTICAL TESTS OF RELIABILITY OF NDE

GEORGE Y. BAAKLINI, STANLEY J. KLIMA, DON J. ROTH, and JAMES D. KISER

May 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEL: 703-487-4650) (N85-21674/NSP, N85-32337/NSP, N86-13749/NSP and N86-16599/NSP)

LEW-14450 Vol. 11, No. 5, P. 40

Capabilities of advanced material-testing techniques analyzed. Collection of four reports illustrates statistical method for characterizing flaw-detecting capabilities of sophisticated nondestructive evaluation (NDE). Method used to determine reliability of several state-of-the-art NDE techniques for detecting failure-causing flaws in advanced ceramic materials considered for use in automobiles, airplanes, and space vehicles.

B87-10230

SOLIDIFICATION EFFECTS IN MAR-M246(HF) ALLOY

M. H. JOHNSTON, and R. A. PARR

May 1987 Additional information on Microfiche available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27066 Vol. 11, No. 5, P. 41

Fatigue properties degraded with crystallographic orientations greater than 10 degrees from 001 axis. Influence of solidification and heat-treatment parameters on structure and fatigue properties of nickel-based superalloy MAR-M246(Hf) described in 24-page report. Superalloys have high strength and corrosion resistance at temperatures up to 1,400 degrees C; their uses range from petrochemical equipment to marine, industrial, aircraft, and vehicular gas turbines.

B87-10274

CATALYTIC OXIDATION OF CO FOR CLOSED-CYCLE CO2 LASERS

I. M. MILLER, D. R. SCHRYER, R. V. HESS, B. D. SIDNEY, G. M. WOOD, JR., P. A. PAULIN, B. T. UPCHURCH (Old Dominion University), and K. G. BROWN (Old Dominion University)

Jun. 1987 Additional information available through: NTIS,

Springfield, VA 22161 (TEL: 703-487-4650) (N85-25445)

LAR-13505 Vol. 11, No. 6, P. 37

Stoichiometric mixture converted completely. High-energy pulsed CO2 lasers have potential for measuring many different features of atmosphere of Earth and particularly useful on airborne or space platforms. For this application, laser must be operated in closed cycle to conserve gas, especially if rare nonradioactive isotopes of carbon and oxygen used. However, laser discharge decomposes fraction of CO2 to CO and O2, causing rapid loss in power leading to erratic behavior. To maintain operation, CO and O2 must be recombined to form CO2.

B87-10275

PROCESSABLE POLYIMIDES CONTAINING ATBN ELASTOMERS

ANNE K. ST. CLAIR, TERRY L. ST. CLAIR, and STEPHEN A. EZZELL (Virginia Polytechnic Inst. & State University)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13178 Vol. 11, No. 6, P. 38

Void-free moldings obtained without serious sacrifice in other properties. New synthesis produces high-temperature linear aromatic polyimide processed in imide form to yield tough, void-free components without serious sacrifice in other properties. Linear aromatic condensation polyimides are materials of prime choice for use as adhesives, composite matrix resins, films, coatings, and/or moldings where durability at temperatures as high as 200 to 300oC needed. Finding increasing use in aircraft and spacecraft applications.

B87-10276

PRETREATMENT OF PLATINUM/TIN OXIDE-CATALYST

ROBERT V. HESS, PATRICIA A. PAULIN, IRVIN M. MILLER, DAVID R. SCHRYER, BARRY D. SIDNEY, GEORGE M. WOOD, BILLY T. UPCHURCH (Chemicon), and KENNETH G. BROWN (Old Dominion University)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13540 LAR-13541 Vol. 11, No. 6, P. 39

Addition of CO to He pretreatment doubles catalytic activity. In sealed, high-energy, pulsed CO2 laser, CO and O2 form as decomposition products of CO2 in laser discharge zone. Products must be recombined, because oxygen concentration of more than few tenths of percent causes rapid deterioration of power, ending in unstable operation. Promising low-temperature catalyst for combining CO and O2 is platinum on tin oxide. New development increases activity of catalyst so less needed for recombination process.

B87-10277

ISOTOPE EXCHANGE IN OXIDE CATALYST

ROBERT V. HESS, IRVIN M. MILLER, DAVID R. SCHRYER, BARRY D. SIDNEY, GEORGE M. WOOD, JR., RONALD F. HOYT, BILLY T. UPCHURCH (Chemicon), and KENNETH G. BROWN (Old Dominion University)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13542 Vol. 11, No. 6, P. 40

Replacement technique maintains level of CO2/18 in closed-cycle CO2 lasers. High-energy, pulsed CO2 lasers using rare chemical isotopes must be operated in closed cycles to conserve gas. Rare isotopes operated in closed cycles to conserve gas. Rare isotopes as CO2/18 used for improved transmission of laser beam in atmosphere. To maintain laser power, CO2 must be regenerated, and O2 concentration kept below few tenths of percent. Conditions achieved by recombining CO and O2.

B87-10278**COPOLYIMIDES WITH FLEXIBILIZING GROUPS**

TERRY L. ST. CLAIR, HAROLD D. BURKS, DONALD J. PROGAR, and K. MASON PROCTOR

Jun. 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEL: 703-487-4650) (N85-31296/NSP)

LAR-13354**Vol. 11, No. 6, P. 40**

Copolymers improved flexibility, processability and melt-flow characteristics. Copolyimide of new type exhibits synergistic improvements in flow properties due to flexibilized diamine-derived units incorporated into polymer backbone. Technique produces copolyimides with combination of flexible linkage that cause polymers to exhibit flow properties particularly well suited for use in wide range of products including adhesives, molding resins, laminating resins, dielectric and protective coatings. Improved properties make copolymers especially useful as thermoplastic hot-melt adhesives.

B87-10279**HIGH-TEMPERATURE COPOLYIMIDE ADHESIVE**

DONALD J. PROGAR, TERRY L. ST. CLAIR, SHARON E. LOWTHER, and KAREN S. WHITLEY

Jun. 1987 Additional information available through: NTIS, Springfield, VA 22161, (TEL: 703-487-4650) (N85-31297/NSP)

LAR-13509**Vol. 11, No. 6, P. 41**

Random Copolyimide, called STPI/LARC, prepared from commercially available materials. Being investigated for use as adhesive or matrix resin for aircraft applications.

B87-10323**DIRECTIONAL SOLIDIFICATION OF NODULAR CAST IRON**

P. A. CURRERI, D. M. STEFANESCU (University of Alabama), and J. C. HENDRIX (University of Alabama)

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28015**Vol. 11, No. 7, P. 46**

Cerium enhances formation of graphite nodules. Preliminary experiments in directional solidification of cast iron shows quantitative correlation of graphite microstructure with growth rate and thermal gradient, with sufficient spheroidizing element to form spheroidal graphite under proper thermal conditions. Experimental approach enables use of directional solidification to study solidification of spheroidal-graphite cast iron in low gravity. Possible to form new structural materials from nodular cast iron.

B87-10324**LARGE DEPLOYABLE SHROUD**

G. G. JACQUEMIN

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28173**Vol. 11, No. 7, P. 46**

Preliminary design proposed for large, lightweight telescope shroud or light shield carried to orbit in single Space Shuttle cargo load. Shroud concept applied on Earth in portable, compactly storable displays or projection screens. Large telescope shroud includes four deployable masts erecting eight walls of hinged panels of polyimide film. Panels stored fanfolded before deployment and threaded on guide wires unwinding from spools and remain taut during deployment.

B87-10325**COTTON-FIBER-FILLED RUBBER INSULATION**

FLOYD A. ANDERSON (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16868**Vol. 11, No. 7, P. 51**

Carbonization of fibers at high temperatures improves strength and erosion resistance. Cotton linters tested as replacement for asbestos filler currently used in rubber insulation in solid rocket motors. Cotton-filled rubber insulation has industrial uses; in some kinds of chemical- or metal-processing equipment, hoses, and protective clothing.

B87-10326**THERMAL-BARRIER COATINGS CONTAINING YTTERBIA**

STEPHAN STECURA

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14057**Vol. 11, No. 7, P. 52**

Resistance to thermal cycling increased. New outer ceramic coating layer for two-layer or graded thermal-barrier coating developed. Ceramic overlay zirconia stabilized with ytterbia and used in conjunction with NiCrAlY or NiCrAlYb bond coats. Two-layer system evaluated in furnace testing at temperatures cycled between 2,025 degrees F and 575 degrees F.

B87-10327**ACETYLENE-TERMINATED POLYIMIDE SILOXANES**

TERRY L. ST. CLAIR, and SHUBBA MAUDGAL (Inst. for Computer Applications in Sci. and Engrg.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13318**Vol. 11, No. 7, P. 52**

Siloxane-containing addition polyimides yield toughened high-temperature adhesives and matrix resins. Addition polyimide made by reaction of aromatic tetracarboxylic acid dianhydride with aromatic diamine in presence of ethynyl-substituted aromatic monoamine. Acetylene-terminated siloxane imide cured by heating to yield acetylene-terminated polyimide siloxane.

B87-10328**CARBIDE/FLUORIDE/SILVER SELF-LUBRICATING COMPOSITE**

HAROLD E. SLINEY

Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-20127, N85-14928, N86-21682, N86-20568)

LEW-14196**Vol. 11, No. 7, P. 53**

Bearing coatings survive at operating temperatures up to 870 degrees C. PS200 composite self-lubricating coating for bearing applications operating at temperatures above failure points of traditional solid lubricants. Excellent friction and wear performance in oxidizing atmospheres up to 1,600 degrees F and reducing atmospheres up to 1,400 degrees F. Performance needed for development of advanced heat engines as adiabatic diesel and Stirling engine.

B87-10329**RAPID-SOLIDIFICATION PROCESSING FACILITY**

THOMAS K. GLASGOW, ROBERT W. JECH, THOMAS J. MOORE, and NORMAN W. ORTH

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14510**Vol. 11, No. 7, P. 54**

Microstructural changes enhance properties of alloys. Major feature of process is rapid quenching of alloys or intermetallic compounds from liquid to solid state at cooling rates of 10 to the 6th power C/s.

B87-10330**POLYIMIDES CONTAINING CARBONYL AND ETHER CONNECTING GROUPS**

04 MATERIALS

PAUL M. HERGENROTHER, and STEPHEN J. HAVENS (PRC Kentron)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13633

Vol. 11, No. 7, P. 54

Semicrystallinity gives rise to tough, solvent-resistant polymers. New polyimides prepared from reaction of aromatic dianhydrides with new diamines containing carbonyl and ether connecting groups between aromatic rings. Diamines prepared from reaction of 4-aminophenol with activated aromatic difluoro compounds in presence of potassium carbonate. These types of polymers have potential applications in molded products, films, adhesives, and composites.

B87-10331

ADVANCED THERMAL-BARRIER BOND COATINGS FOR ALLOYS

STEPHEN SECURA

Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-31283/NSP)

LEW-14415

Vol. 11, No. 7, P. 56

New and improved bond coatings developed for use in thermal-barrier systems on Ni, Co-, and Fe-base alloy substrates. Use of these new bond coatings, containing yttrium instead of yttrium, significantly increased lives of resultant thermal-barrier systems. Uses include many load-bearing applications in high-temperature, hostile environments.

B87-10332

POLYIMIDES FROM BTDA, M-PDA, AND HDA

CHADWICK B. DELANO (Acurex Corp.), and CHARLES J. KISKIRAS (Acurex Corp.)

Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-31239/NSP)

LAR-13635

Vol. 11, No. 7, P. 56

Aliphatic segments in polyimide backbones achieve low molding temperatures and resistance to solvents. Low molding temperatures in combination with good solvent resistance make these polymers candidates for use in aerospace applications.

B87-10333

ALUMINUM ALLOYS FOR HIGH TEMPERATURES

PETER J. MESCHTER (McDonnell Douglas Corp.), RICHARD J. LEDERICH (McDonnell Douglas Corp.), and JAMES E. O'NEAL (McDonnell Douglas Corp.)

Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-31698/NSP)

LAR-13632

Vol. 11, No. 7, P. 58

New Al/Li alloys processed by rapid solidification show greatly improved strength-to-density ratios. Alloys suitable substitutes for heavier titanium alloys and weaker aluminum alloys in high-performance aircraft, bombers, and transports. Also suitable for use in high-performance-aircraft structures heated by engines and normally constructed from titanium alloys.

B87-10334

RECYCLING SILANE

RALPH LUTWACK (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16625

Vol. 11, No. 7, P. 59

Costly gas purified after use in deposition reactor. Proposed method for recycling silane reduces cost of producing pure silicon for semiconductor devices.

B87-10335

EXTINGUISHING FUEL-LEAK FIRES IN JET ENGINES

R. L. ALTMAN

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11553

Vol. 11, No. 7, P. 59

Potassium dawsomite and several other chemicals effective in delaying reignition. Report describes tests of dry chemicals for extinguishing fires on jet engines.

B87-10336

DIELECTRIC MONITORING OF CURING COMPOSITES

BENJAMIN E. GOLDBERG, and MARIE L. SEMMEL

Jul. 1987 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27082

Vol. 11, No. 7, P. 59

Report describes preliminary attempts at dielectric monitoring of curing of graphite/epoxy and carbon/phenolic composites. Objective is to develop dielectric monitoring for optimizing curing process and reduce incidence of failures of produced composite structures.

B87-10337

PRODUCING LOW-OXYGEN SAMARIUM/COBALT MAGNET ALLOY

DILIP K. DAS (The Charles Stark Draper Laboratory, Inc.), KAPLESH KUMAR (The Charles Stark Draper Laboratory, Inc.), ROBERT T. FROST (General Electric Co.), and C. W. CHANG (General Electric Co.)

Jul. 1987 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27011

Vol. 11, No. 7, P. 60

Experiments aimed at producing SmCo5 alloy with low oxygen contamination described in report. Two methods of alloying by melting without contact with crucible walls tested. Lowest oxygen contamination, 70 parts per million achieved by dc arc melting on water-cooled, tantalum-clad copper hearth in purified quiescent argon atmosphere. Report includes photographs of equipment, photomicrographs of alloy samples, detailed descriptions of procedures tried, and tables of oxygen contamination and intrinsic coercivities of samples produced.

B87-10338

EFFECTS OF HYDROGEN ON EXPERIMENTAL ALLOYS

K. F. TOSI (United Technologies Corp.), J. MUCCI (United Technologies Corp.), J. R. TEEL (United Technologies Corp.), D. G. KELLY (United Technologies Corp.), B. J. HOLLEY (United Technologies Corp.), and J. GREENWOOD (United Technologies Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27060

Vol. 11, No. 7, P. 60

Report presents results of tensile tests on experimental alloys for use in contact with pressurized hydrogen gas. Determined extent tensile strength deteriorated in hydrogen. Specimen materials included Incoloy(R) 907, various Fe/Ni/Co/Cr alloys, and some Cu/Ni alloys. Describes materials, equipment, and procedures. Presents conclusions for program and for individual tests. Includes information from 23 previously issued monthly progress reports.

B87-10394

CRYSTAL GROWTH IN LIQUID-ENCAPSULATED FLOAT ZONE

ROBERT J. NAUMANN, DONALD O. FRAZIER, SANDOR

LEHOCZKY, MARCUS VLASSE, and BARBARA FACEMIRE
Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-28144

Vol. 11, No. 8, P. 44

Suitably chosen liquid encapsulant placed around melt zone in float-zone crystal-growth system performs four important functions enhancing purity and reducing strains and dislocations in final crystal. In new technique, grow dislocation-free crystals with precisely controlled composition even from materials not amenable to conventional float-zone crystal-growth method. Support provided by encapsulant make it practical to process materials of low surface tension.

B87-10395

TAILORABLE ADVANCED BLANKET INSULATION (TABI)

PAUL M. SAWKO, and HOWARD E. GOLDSTEIN

Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

ARC-11697

Vol. 11, No. 8, P. 45

Single layer and multilayer insulating blankets for high-temperature service fabricated without sewing. TABI woven fabric made of aluminoborosilicate. Triangular-cross-section flutes of core filled with silica batting. Flexible blanket formed into curved shapes, providing high-temperature and high-heat-flux insulation.

B87-10396

LIGHT, STRONG INSULATING TILES

E. CORDIA (Lockheed Missiles & Space Co.), and J. SCHIRLE
(Lockheed Missiles & Space Co.)

Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MSC-20601

Vol. 11, No. 8, P. 45

Improved lightweight insulating silica/aluminum borosilicate/silicon carbide tiles combine increased tensile strength with low thermal conductivity. Changes in composition substantially improve heat-insulating properties of silica-based refractory tile. Silicon carbide particles act as high-emissivity radiation scatterers in tile material.

B87-10397

PAINT-BONDING IMPROVEMENT FOR 2219 ALUMINUM ALLOY

ALFRED F. DAECH (Martin Marietta Corp.), and AUDREY Y. CIBULA (Martin Marietta Corp.)

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28166

Vol. 11, No. 8, P. 48

Bonding of adhesives and primers to 2219 aluminum alloy improved by delaying rinse step in surface-treatment process. Delaying rinse allows formation of rougher surface for stronger bonding and greater oxide buildup.

B87-10398

CLARIFICATION PROCEDURE FOR GELS

PATRICK G. BARBER (Longwood College), and NORMAN R. SIMPSON (Longwood College)

Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

LAR-13476

Vol. 11, No. 8, P. 48

Procedure developed to obtain transparent gels with consistencies suitable for crystal growth, by replacing sodium ions in silicate solution with potassium ions. Clarification process uses cation-exchange resin to replace sodium ions in stock solution with potassium ions, placed in 1M solution of soluble potassium

salt. Slurry stirred for several hours to allow potassium ions to replace all other cations on resin. Supernatant solution decanted through filter, and beads rinsed with distilled water. Rinsing removes excess salt but leaves cation-exchange beads fully charged with potassium ions.

B87-10399

LOCALIZED DENSIFICATION OF TILE FOR IMPACT RESISTANCE

LAURENCE W. SMISER (Rockwell International Corp.), and JACK W. HOLT (Rockwell International Corp.)

Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MSC-20612

Vol. 11, No. 8, P. 49

Densification process increases impact resistance of lightweight, porous silica tile without appreciably raising weight. Colloidal suspension of silica used to increase density of small portion of tile to be strengthened. Process controls penetration of suspension laterally and vertically so densification limited to volume where needed. Insures weight increased only minimally. See also 'Attaching Metal Fasteners to Silica Tiles' (MSC-20537).

B87-10400

MAKING HIGHLY POROUS CERAMICS

DAVID J. GREEN (Rockwell International Corp.)

Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MSC-20782

Vol. 11, No. 8, P. 50

Rigid, lightweight insulation withstands temperatures greater than 1,400 degrees C made by cryogenic freeze-drying process. New insulation expected to have solid content as low as 1 percent by volume and to be mechanically isotropic.

B87-10401

EFFECTS OF LOW GRAVITY ON SUPERALLOY SOLIDIFICATION

M. H. JOHNSTON, R. A. PARR, P. A. CURRERI, and WENDY ALTER

Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-28027

Vol. 11, No. 8, P. 50

Report describes experiments on directional solidification on MAR-M246(Hf) superalloy in low gravity. Determines effects of reduction in gravity on growth of dendrites and on resultant interdendritic segregation of various constituents, particularly of additive hafnium. Interdendritic spacings and carbide contents increase.

B87-10402

SOLIDIFYING MN/BI IN A MAGNETIC FIELD

J. L. DECARLO (Grumman Aerospace Corp.), and RON G. PIRICH (Grumman Aerospace Corp.)

Sep. 1987 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-28123

Vol. 11, No. 8, P. 52

Report describes experiments in directional solidification of eutectic Mn/BI in magnetic field. Study determines whether effects of gravitationally-induced convection reduced or eliminated by magnetic field. Morphological, thermal, and magnetic analyses done on samples grown at various speeds and various applied strengths. Magnetic effects similar to those of low gravity.

B87-10403
TRIFLUOROPHENYLETHYLIDENE CONDENSATION
POLYIMIDES

WILLIAM B. ALSTON, and ROY F. GRATZ (Mary Washington College)

Sep. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-12311/NSP)

LEW-14386 Vol. 11, No. 8, P. 52

Report describes synthesis and properties of trifluorophenylethylidene (3F) condensation polyimides. Properties of these new polymers make suitable thermal-control coatings, interlayer dielectrics in advanced wafer chips, and electronic-multilevel-interconnection layers.

B87-10463
THERMOMECHANICAL PROPERTIES INDICATE DEGREE OF
EPOXY CURE

MUZAFFER CIZMECIOGLU (Caltech), AMITAVA GUPTA (Caltech), and ROBERT F. FEDORS (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16903 Vol. 11, No. 9, P. 58

Glass-transition temperature and density increase as reaction proceeds. Cured epoxy resin found to be related to extent of cure. In addition to providing insight into chemical reactions of curing, relationships show potential for process monitoring and control in fabrication of strong, lightweight composite parts.

B87-10464
FLUIDIZED-BED CLEANING OF SILICON PARTICLES

NARESH K. ROHATGI (Caltech), and GEORGE C. HSU (Caltech)
 Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16935 Vol. 11, No. 9, P. 59

Fluidized-bed chemical cleaning process developed to remove metallic impurities from small silicon particles. Particles (250 micrometer in size) utilized as seed material in silane pyrolysis process for production of 1-mm-size silicon. Product silicon (1 mm in size) used as raw material for fabrication of solar cells and other semiconductor devices. Principal cleaning step is wash in mixture of hydrochloric and nitric acids, leaching out metals and carrying them away as soluble chlorides. Particles fluidized by cleaning solution to assure good mixing and uniform wetting.

B87-10465
BISMALEIMIDE COPOLYMER MATRIX RESINS

JOHN A. PARKER, ALVIN H. HEIMBUCH, MING-TA S. HSU (H. C. Chem Research & Service Corp.), and TIMOTHY S. CHEN (H. C. Chem Research & Service Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11599 Vol. 11, No. 9, P. 60

Graphite composites, prepared from 1:1 copolymer of two new bismaleimides based on N,N'-m-phenylene-bis(m-amino-benzamide) structure have mechanical properties superior to those prepared from other bismaleimide-type resins. New heat-resistant composites replace metal in some structural applications. Monomers used to form copolymers with superior mechanical properties prepared by reaction of MMAB with maleic or citraconic anhydride.

B87-10466
DESIGN OF FIBER COMPOSITES FOR STRUCTURAL
DURABILITY
 CHRISTOS C. CHAMIS

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-27978/NSP)

LEW-14385 Vol. 11, No. 9, P. 61

Hygrothermomechanical effects analyzed by computers. Computational methodology developed and available at NASA Lewis Research Center to design and analyze fiber-composite structures subjected to complex hygrothermomechanical environments. Includes composite mechanics and advanced finite-element structural-analysis methods. Methodology applied to such problems as progressive fracture of composite material, design of composite material for cycle fatigue combined with hot and wet conditions, and general composite-laminate configurations.

B87-10467
PROTECTIVE COATINGS FOR SPACECRAFT POLYMERS

BRUCE A. BANKS, MICHAEL J. MIRTICH, JR., SHARON K. RUTLEDGE, HENRY K. NAHRA, and DIANE SWEC

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-30137/NSP)

LEW-14384 Vol. 11, No. 9, P. 61

Thin films of metal-oxide/polymer applied by ion-beam sputtering. Report describes experiments in development of coatings to protect polymers from bombardment by atomic oxygen.

B87-10468
TRIBOLOGICAL PROPERTIES OF STRUCTURAL CERAMICS

DONALD H. BUCKLEY, and KAZUHISA MIYOSHI

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-10341/NSP)

LEW-14387 Vol. 11, No. 9, P. 64

Paper discusses tribological properties of structural ceramics. Function of tribological research is to bring about reduction in adhesion, friction, and wear of mechanical components; to prevent failures; and to provide long, reliable component life, through judicious selection of materials, operating parameters, and lubricants. Paper reviews adhesion, friction, wear, and lubrication of ceramics; anisotropic friction and wear behavior; and effects of surface films and interactions between ceramics and metals. Analogies with metals are made. Both oxide and nonoxide ceramics, including ceramics used as high temperature lubricants, are discussed.

B87-10469
AMORPHOUS INSULATOR FILMS WITH CONTROLLABLE
PROPERTIES

SAMUEL A. ALTEROVITZ, JOSEPH D. WARNER, DAVID C. LIU, and JOHN J. POUCH

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-12134/NSP)

LEW-14370 Vol. 11, No. 9, P. 64

In experiments described in report, amorphous hydrogenated carbon films grown at room temperature by low-frequency plasma deposition, using methane or butane gas. Films have unique array of useful properties; (a) adhere to wide variety of materials; (b) contain only carbon and hydrogen; (c) smooth and free of pinholes; (d) resistant to attack by moisture and chemicals; and (e) have high electric-breakdown strength and electrical resistivity. Two of optical properties and hardness of this film controlled by deposition conditions. Amorphous a-C:H and BN films used for hermetic sealing and protection of optical, electronic, magnetic, or delicate mechanical systems, and for semiconductor field dielectrics.

B87-10470
RADIATION RESISTANCES OF DIELECTRIC LIQUIDS

FRANK L. BOUQUET (Caltech), and ROBERT B. SOMOANO (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-16891**Vol. 11, No. 9, P. 65**

Report presents data on effects of ionizing radiation on dielectric liquids for high-energy-density, pulsed-power capacitors. Based on Jet Propulsion Laboratory test results, search of NASA and Department of Energy computer files, survey of open literature, and contacts with manufacturers and suppliers. Covers 22 organic liquids, although detailed data found for only one compound, polydimethyl siloxane. Generic data on effects of radiation on compounds with similar chemical structures provided where data on specific compounds lacking.

B87-10530**THERMOSETTING FLUOROPOLYMER FOAMS**

SHENG YEN LEE

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13008**Vol. 11, No. 10, P. 54**

New process makes fluoropolymer foams with controllable amounts of inert-gas fillings in foam cells. Thermosetting fluoropolymers do not require foaming additives leaving undesirable residues and do not have to be molded and sintered at temperatures of about 240 to 400 degree C. Consequently, better for use with electronic or other parts sensitive to high temperatures or residues. Uses include coatings, electrical insulation, and structural parts.

B87-10531**POLYPHENYLQUINOXALINES CONTAINING ALKYLENEDIOXY GROUPS**

PAUL M. HERGENROTHER, STEPHEN J. HAVENS (PRC Kentron, Inc.), and FRANK W. HARRIS (University of Akron)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13601**Vol. 11, No. 10, P. 54**

New polyphenylquinoxalines (PPQ's) prepared from reaction of novel bis(alpha-diketones) with aromatic bis(o-diamines). Contain alkylenedioxy groups in repeating units. Lower glass-transition temperatures and melt viscosities and better processability than all-aromatic PPQ's. Tensile strength, modulus, elongation, adhesive strength, fracture energy, and solvent resistance of new polymers comparable with properties of known PPQ's. Useful as adhesives, coatings, films, and molded products, particularly for aerospace applications.

B87-10532**DEGRADATION OF REFLECTORS AND DIELECTRICS**

FRANK L. BOUQUET (Caltech), EDWARD F. CUDDIHY (Caltech), and CARL R. MAAG, JR. (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16711**Vol. 11, No. 10, P. 55**

Report describes important degrading effects of atmosphere and outer-space environments on reflective surfaces and dielectrics. For reflective surfaces, terrestrial effects include soiling on glass surfaces and changing with time. Space effects include ultraviolet enhancement of contamination and possible surface erosion due to solar radiation, impact of debris, and interactions with atomic oxygen. Dielectrics similarly affected in both environments.

B87-10533**ADVANCES IN THERMOELECTRIC MATERIALS**

CHARLES WOOD (Caltech)

Nov. 1987 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16885**Vol. 11, No. 10, P. 55**

Rare-earth chalcogenides and boron-rich borides show promise. Report discusses search for materials performing more efficiently in high-temperature thermoelectric conversion. Begins with summary of developments during past three decades. Followed by brief introduction to theory of thermoelectric energy conversion, then by experimental findings and by some additional theory on specific materials.

B87-10541**CALCULATING TRANSPORT OF MOISTURE THROUGH HONEYCOMB PANELS**

R. T. MARTIN (Rockwell International Corp.), and D. J. ZIGRANG (Rockwell International Corp.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21144**Vol. 11, No. 10, P. 60**

Diffusion equations solved for steady-state and transient conditions. HUMID is computer program for predicting moisture gradients and internal bursting pressure in composite honeycomb-sandwich panels. Designed to monitor ebb and flow of moisture in Space Shuttle Orbiter payload bay doors, but applicable for general use. Written in FORTRAN.

B87-10542**LAMINATE-MOISTURE-ANALYSIS COMPUTER PROGRAM**

RONALD T. MARTIN (Rockwell International Corp.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21143**Vol. 11, No. 10, P. 60**

Diffusion and deleterious effects of moisture predicted. General One-Dimensional, One Material Moisture Analysis computer program developed to predict moisture gradient across composite laminate where moisture enters two surfaces and flows in direction between these surfaces. Designed to monitor flow of moisture in Space Shuttle Orbiter payload bay doors but applicable for general use. Program written in FORTRAN IV.

B87-10543**ICAN: INTEGRATED COMPOSITES ANALYZER**

CHRISTOS C. CHAMIS, and PAPPU L. N. MURTHY

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14468**Vol. 11, No. 10, P. 62**

Program calculates macromechanical, micromechanical, and related environmental effects. Computer code ICAN developed to carry out comprehensive linear analyses of multilayered fiber composites. Contains essential features required to design structural components made from fiber composites. Code in FORTRAN IV.

B88-10028**STRONGER FIRE-RESISTANT EPOXIES**

GEORGE M. FOHLEN, JOHN A. PARKER, and DEVENDRA KUMAR

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11548**Vol. 12, No. 1, P. 61**

New curing agent improves mechanical properties and works at lower temperature. Use of aminophenoxycyclotriposphazene curing agents yields stronger, more heat- and fire-resistant epoxy

04 MATERIALS

resins. Used with solvent if necessary for coating fabrics or casting films.

B88-10029

POLYARYLENE ETHERS WITH IMPROVED PROPERTIES

PAUL M. HERGENROTHER, BRIAN J. JENSEN, and STEPHEN J. HAVENS (PRC Kentron, Inc.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13555

Vol. 12, No. 1, P. 61

Series of new polyarylene ethers (PAE's) prepared from reaction of activated dihalo compounds with various bisphenols. Compounds exhibit excellent processability by compression molding, plus good mechanical properties. All PAE's prepared suitable for use as adhesives, coatings, films, membranes, and composite matrices. Potentially useful for spacecraft and aircraft applications.

B88-10030

AIR REVITALIZATION USING SUPEROXIDES

THEODORE WYDEVEN, PETER C. WOOD (San Jose State University), and L. A. SPITZE (San Jose State University)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11695

Vol. 12, No. 1, P. 62

Pellets made from powder mixtures of potassium superoxide, KO₂, and calcium superoxide, Ca(O₂)₂, proven markedly superior to pellets of pure KO₂ for adding O₂ to and removing CO₂ from atmospheric-pressure flow of humidified CO₂ in He. Superoxides used extensively to supply O₂ and scrub CO₂ in variety of ambient-pressure life-support applications, including portable self-contained breathing apparatuses, spacecraft, and undersea submersible craft.

B88-10031

MICROSTRUCTURE AND WELD CRACKING IN INCONEL 718(R)

R. G. THOMPSON (University of Alabama)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27121

Vol. 12, No. 1, P. 63

Theories on relationship between metallurgy and microfissuring confirmed. Report describes research on effects of microstructure on cracking of heat-affected zones of welds in Inconel 718(R) alloy. In experimental studies, specimens subjected to various combinations of time-varying thermal and mechanical stresses to simulate welding conditions and to identify physical and chemical effects causing microfissuring.

B88-10032

LUBRICATION HANDBOOK FOR THE SPACE INDUSTRY

ERNEST L. MCMURTREY

Jan. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27169

Vol. 12, No. 1, P. 64

A 458-page handbook covers many of solid and liquid lubricants used in space industry. Also useful reference in industrial and military applications of lubricants. Part A of handbook compilation of data on chemical and physical properties of over 250 solid lubricants, including bonded solid lubricants, dispersions, and composites. Part B covers over 250 liquid lubricants, greases, oils, compounds, and fluids.

B88-10033

OPTIMIZATION OF PROCESSING OF Si₃N₄

WILLIAM A. SANDERS, and GEORGE Y. BAAKLINI

Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-31729/NSP)

LEW-14456

Vol. 12, No. 1, P. 64

Process changes iterated under guidance of x-radiography. In recent work at NASA Lewis Research Center, density gradients in sintered silicon nitride, characterized by x-radiography, identified and appeared strongly dependent upon powder-processing and sintering conditions. NASA technical memorandum describes systematic investigation, based upon preliminary work, of density-gradient/flexural-strength relationships as affected by processing.

B88-10034

GALVANIC CORROSION IN (GRAPHITE/EXPOXY)/ALLOY COU PLES

MERLIN D. DANFORD, and RALPH H. HIGGINS

Jan. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27055

Vol. 12, No. 1, P. 64

Effects of galvanic coupling between graphite/epoxy composite material, G/E, and D6AC steel, 6061-T6 aluminum, and Inconel(R) 718 nickel alloy in salt water described in report. Introductory section summarizes previous corrosion studies of G/E with other alloys. Details of sample preparation presented along with photographs of samples before and after immersion.

B88-10035

TEMPERATURE, HUMIDITY, AND POLYMER AGING

EDWARD F. CUDDIHY (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16908

Vol. 12, No. 1, P. 65

Report presents analysis of experimental data on electrical resistivity of polymer (polyvinyl butyral) as function of temperature and relative humidity. Resulting theoretical expression for electrical resistivity resembles generally accepted empirical law for the corrosion rate.

B88-10036

EFFECTS OF RADIATION ON INSULATORS

FRANK L. BOUQUET (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17032

Vol. 12, No. 1, P. 66

Report presents data on responses of electrically insulating thermosetting and thermoplastic polymers to radiation. Lowest-threshold-dose (LTD) levels and 25-percent-change levels presented for such properties as tensile strength and electrical resistivity. Data on radiation-induced outgassing also given.

B88-10040

STRAIN-ENERGY-RELEASE RATES IN DELAMINATION

I. S. RAJU (Analytical Services and Materials, Inc.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13698

Vol. 12, No. 1, P. 73

Q3DG computer program developed to perform quasi-three-dimensional stress analysis of composite laminates containing delaminations. Calculates strain-energy-release rates for long, rectangular composite laminates containing delaminations and subjected to any combination of mechanical, thermal, and hygroscopic loading. Written in FORTRAN V.

B88-10100

FLUIDIZED-BED DEPOSITION OF SINGLE-CRYSTAL SILICON
 GEORGE C. HSU (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and NARESH K. ROHATGI (Jet Propulsion Lab., California Inst. of Tech., Pasadena.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16608**Vol. 12, No. 2, P. 54**

Uniformly thin single-crystal films of silicon produced by modification of fluidized-bed-reactor technique producing polysilicon by chemical vapor deposition. Proposed for silicon wafers for flat-plate solar arrays and results in different structural and electronic properties in deposition layer desirable for specific microelectronic or solar-cell processing. In process deposition occurs on silicon wafers, kept individually at temperatures above 1,000 degree C. Heated wafers held in unheated and minimally-agitated-fluidized bed of silicon particles and in low concentration of silane.

B88-10101

WICKS FOR REFRIGERANTS IN HEAT PIPES

BENJAMIN SEIDENBERG

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13019**Vol. 12, No. 2, P. 56**

Ultra-high-molecular-weight material compatible with efficient heat-transfer fluids. New wick material for heat pipes first physically and chemically compatible with chlorofluoromethanes, chlorofluoroethanes, and ammonia. Allows one of these refrigerants to be used as working fluid in capillary-pump heat-pipe loop for cooling electronic equipment.

B88-10102

FIRE-RESISTANT POLYAMIDES CONTAINING PHOSPHORUS

DEMETRIUS A. KOURTIDES, and JOHN A. MIKROYANNIDIS

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11512**Vol. 12, No. 2, P. 56**

Flammability and weight loss reduced. Fire-resistant polymers obtained from 1-(dialkoxyposphonyl) methyl-2, 4- and -2, 6-diaminobenzenes by reaction with acyl or diacyl halides of higher functionality. Incorporation of compounds containing phosphorus into certain polymers shown previously to increase fire retardance. Discovery adds new class of polyamides to group of such polymers.

B88-10103

SYNTHESIS OF B, B', B'-TRICHLOROBORAZINE

SALVATORE R. RICCIETELLO, TIMOTHY S. CHEN (HC Chem Research), and MING-TA S. HSU (HC Chem Research)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11643**Vol. 12, No. 2, P. 57**

Simplified, relatively safe, and economical synthesis of B, B', B'-trichloroborazine easily practiced in standard organic-chemistry laboratory. Yield is 20 to 30 percent, fairly acceptable value in view of inherent difficulty of synthesizing borazines. New synthesis has potential use in industry.

B88-10104

SLOW RELEASE OF REAGENT CHEMICALS FROM GEL MATRICES

WILLIAM J. DEBNAM, PATRICK G. BARBER (Longwood College), and JAMES COLEMAN (Longwood College)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13607**Vol. 12, No. 2, P. 57**

Procedure developed for slow release of reagent chemicals into solutions. Simple and inexpensive and not subject to failure of equipment. Use of toothpaste-type tube or pump dispenser conceivably provides more controlled technique for storage and dispensation of gel matrix. Possible uses include controlled, slow release of reagents in chemical reactions, crystal growth, space-flight experiments, and preformed gel medications from packets.

B88-10105

FIRE-RESISTANT, PLASTIC-FOAM AIRDUCTS

SOUZANE H. TACAWY (McDonnell-Douglas Corp.), and EDWARD L. TRABOLD (McDonnell-Douglas Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21186**Vol. 12, No. 2, P. 58**

Polyimide-foam airducts low in cost and light in weight. Relatively safe in fires because they resist spread of flames and generate little smoke. Polyimide-foam ducts less expensive to manufacture. Suitable for heating and air-conditioning in airplanes, ships, trains, and buildings.

B88-10106

BORON CARBIDES AS THERMO-ELECTRIC MATERIALS

CHARLES WOOD (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16887**Vol. 12, No. 2, P. 58**

Report reviews recent theoretical and experimental research on thermoelectric materials. Recent work with narrow-band semiconductors demonstrated possibility of relatively high thermoelectric energy-conversion efficiencies in materials withstanding high temperatures needed to attain such efficiencies. Among promising semiconductors are boron-rich borides, especially boron carbides.

B88-10107

COMPOSITES THAT EXCEED SUPERALLOYS IN RUPTURE STRENGTH

DONALD W. PETRASEK

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14594**Vol. 12, No. 2, P. 58**

Ceramic-fiber-reinforced iron alloys show promise as turbine parts for intermediate-temperature service. Intermediate-temperature composites reduce weights of turbine blades by 40 percent and increase life expectancies of blades. In study, relatively-low-temperature fabrication process, hollow-cathode sputtering developed.

B88-10108

THERMAL RESPONSE OF COMPOSITE INSULATION

DAVID A. STEWART, DANIEL B. LEISER, MARNELL SMITH, and PAUL KOLODZIEJ (Informatics, Inc.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11680**Vol. 12, No. 2, P. 59**

Engineering model gives useful predictions. Pair of reports presents theoretical and experimental analyses of thermal responses of multiple-component, lightweight, porous, ceramic insulators. Particular materials examined destined for use in Space Shuttle thermal protection system, test methods and heat-transfer theory useful to chemical, metallurgical, and ceramic engineers

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needing to calculate transient thermal responses of refractory composites.

B88-10109

STEELS FOR ROLLING-ELEMENT BEARINGS

ERWIN V. ZARETSKY

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N87-11993/NSP)

LEW-14546

Vol. 12, No. 2, P. 60

Bearing lives increased by attention to details of processing and applications. NASA technical memorandum discusses selection of steels for long-life rolling-element bearings. After brief review of advances in manufacturing, report discusses effect of cleanliness of bearing material on fatigue in rolling element. Also discusses fracture toughnesses of through-hardened and case-hardened materials.

B88-10110

SOLIDIFICATION-RATE EFFECTS IN MAR-M-246 + HF ALLOY

DAVID HAMILTON

Feb. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27057

Vol. 12, No. 2, P. 60

Under slower solidification, primary-dendrite-arm spacing increases. Report discusses experiments on influence of solidification rates on crystallographic orientation and mechanical properties of superalloy MAR-M-246 + Hf. Specimens grown in directional-solidification furnace, visually examined for microstructure, and stretched to failure in tensile-testing machine. Back-reflection Laue x-ray photographs taken to determine growth orientations.

B88-10111

RHEOLOGICAL TESTS OF SHEAR-THICKENING-POLYMER SOLUTIONS

ROBERT F. LANDEL (Caltech), SOREN HVIDT (Caltech), and JOHN D. FERRY (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16778

Vol. 12, No. 2, P. 60

Vibrational method avoids thickening during measurement. Report describes measurements of viscoelastic properties of FM-9, a polymer being considered as antimisting agent for jet fuel. Purpose of agent is to prevent formation of flammable mist during aircraft crash.

B88-10112

MECHANICAL PROPERTIES OF LARGE SODIUM IODIDE CRYSTALS

HENRY M. LEE

Feb. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-28158

Vol. 12, No. 2, P. 61

Report presents data on mechanical properties of large crystals of thallium-doped sodium iodide. Five specimens in shape of circular flat plates subjected to mechanical tests. Presents test results for each specimen as plots of differential pressure versus center displacement and differential pressure versus stress at center. Also tabulates raw data. Test program also developed procedure for screening candidate crystals for gamma-ray sensor. Procedure eliminates potentially weak crystals before installed and ensures material yielding kept to minimum.

B88-10175

STRESS-AND-STRAIN ANALYSIS OF HOT METAL/FIBER COMPOSITES

DALE A. HOPKINS, and CHRISTOS C. CHAMIS

Mar. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-24757)

LEW-14591

Vol. 12, No. 3, P. 44

Macroscopic mechanical properties derived from micromechanics. Stress-and-strain equations developed to express microscopic and macroscopic mechanical properties of metals reinforced by unidirectional fibers, over range of temperatures. New equations reduce computational load by providing approximate, closed-form expressions for microscopic and pseudohomogeneous anisotropic properties of single ply reinforced by unidirectional fibers. Typical application is calculation of residual stress in newly manufactured article.

B88-10176

CARBORANYLMETHYLENE-SUBSTITUTED CYCLOPHOSPHAZENE POLYMERS

HARRY R. ALLCOCK (Pennsylvania State University), and ANGELO G. SCOPELIANOS (Pennsylvania State University)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11370

Vol. 12, No. 3, P. 46

New synthesis produces unusual electrical and chemical properties. New class of polymers based on cyclophosphazene monomers substituted with carboranylmethylene groups. Starting material commercially available.

B88-10177

ELECTROCHEMICAL GROWTH OF CRYSTALS IN GELS

PATRICK G. BARBER (Longwood College), and JAMES COLEMAN (Longwood College)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13608

Vol. 12, No. 3, P. 48

Nucleation and growth rates readily controlled. Technique developed to grow crystals by controlling rate of transfer of one component into crystallization volume. Method involves electrochemically controlled generation of one of precipitation species, coupled with diffusion barrier. New procedure, developed in connection with formation of lead tin telluride by reaction in gels of metal ions with telluride ions.

B88-10178

CONTAMINATION BARRIER FOR CONTOUR-MOLDING MATERIAL

JAMES F. ADAMS (Rockwell International Corp.)

Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29240

Vol. 12, No. 3, P. 49

Release agent prevents molding compound from adhering to or contaminating surface. Cleaning agent, Turco 4215 NCLT, forms barrier preventing silicone molding compound from sticking to surface and leaving contaminating residue. Also see MFS-29243.

B88-10179

MOLDING COMPOUND FOR INSPECTION OF INTERNAL CONTOURS

JIM ADAMS (Rockwell International Corp.), and STEVE RICKLEFS (Rockwell International Corp.)

Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29243

Vol. 12, No. 3, P. 49

Material clean, sets rapidly, and easy to use. Silicone elastomer,

Citrocon or equivalent, commonly used in dentistry, in combination with mold-release agent (Also see MFS-29240), speeds and facilitates making of impressions of interior surfaces so surface contours examined. Elastomer easily moved around in cavity until required location found.

B88-10180**CALCULATING PERCENT GEL FOR PROCESS CONTROL**

CHARLES NEAL WEBSTER (LTV Aerospace Corp.), and ROBERT O. SCOTT (LTV Aerospace Corp.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-21169**Vol. 12, No. 3, P. 49**

Reaction state of thermosetting resin tracked to assure desired properties. Rate of gel determined as function of temperature by measuring time to gel of part of graphite fabric impregnated with Hexcel R120 (or equivalent) phenolic resin.

B88-10181**STIFFNESS PROPERTIES OF LAMINATED GRAPHITE/EPOXY CYLINDERS**

R. NOEL TOLBERT (Tennessee Technical University)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27157**Vol. 12, No. 3, P. 51**

Report discusses stiffnesses of cylindrical shells formed from composite graphite/epoxy laminates, as calculated from traditional composite-lamination theory. Shells evaluated for use as cases for solid-fuel rocket motors. Stiffness results compared with quasi-experimental stiffnesses developed from pressure tests of cylindrical bottles. Sensitivities of stiffnesses to variations in constituent materials and in geometric parameters examined with help of two computer programs, included in appendix to report.

B88-10182**NONISOTHERMAL CRYSTALLIZATION IN PEEK/FIBER COMPOSITE**

PEGGY CEBE (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17226**Vol. 12, No. 3, P. 52**

Several features of crystallization process attributable to fibers. Report describes experiments in nonisothermal crystallization of poly(ether-etherketone)(PEEK) in APC-2.

B88-10183**ESTIMATING THE CRACK-EXTENSION-RESISTANCE CURVE**

THOMAS W. ORANGE

Mar. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-18750)

LEW-14509**Vol. 12, No. 3, P. 52**

Curve now obtained from residual-strength data alone. New analytical method enhances capability to determine crack-extension curve or 'R-curve' of sample.

B88-10184**INVESTIGATION OF EPOXY CURING**

D. E. CAGLIOSTRO, A. ISLAS, and MING-TA HSU (H. C. Chem Corp.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11810**Vol. 12, No. 3, P. 52**

Kinetic model describes major features of curing process.

Report describes investigation of curing of epoxy resin used in carbon-fiber/epoxy version of cases of Space Shuttle booster rockets.

B88-10185**MICROSTRUCTURE OF MNBI/BI EUTECTIC ALLOY**

WILLIAM R. WILCOX (Clarkson University), G. F. EISA (Clarkson University), B. BASKARAN (Clarkson University), and DONALD C. RICHARDSON (Clarkson University)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27174**Vol. 12, No. 3, P. 54**

Collection of three reports describes studies of directional solidification of MnBi/Bi eutectic alloy. Two of the reports, 'Influence of Convection on Lamellar Spacing of Eutectics' and 'Influence of Convection on Eutectic Microstructure,' establish theoretical foundation for remaining document. Reports seek to quantify effect of convection on concentration field of growing lamellar eutectic. Remaining report, 'Study of Eutectic Formation,' begins by continuing theoretical developments. New technique under development by one of the authors helps to reveal three-dimensional microstructures of alloys.

B88-10234**CERAMIC FABRIC COATED WITH SILICON CARBIDE**

S. R. RICCIHELLO, M. SMITH, H. GOLDSTEIN, and N. ZIMMERMAN

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11641**Vol. 12, No. 4, P. 42**

Material used as high-temperature shell. Ceramic fabric coated with silicon carbide (SiC) serves as tough, heat-resistant covering for other refractory materials. Developed to protect reusable insulating tiles on advanced space transportation systems. New covering makes protective glaze unnecessary. Used on furnace bricks or on insulation for engines.

B88-10235**IMPROVED ZIRCONIA OXYGEN-SEPARATION CELL**

JOHN V. WALSH (Caltech), and JAMES G. ZWISSLER (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16161**Vol. 12, No. 4, P. 42**

Cell structure distributes feed gas more evenly for more efficient oxygen production. Multilayer cell structure containing passages, channels, tubes, and pores help distribute pressure evenly over zirconia electrolytic membrane. Resulting more uniform pressure distribution expected to improve efficiency of oxygen production.

B88-10236**RUST INHIBITOR AND FUNGICIDE FOR COOLING SYSTEMS**

JAMES F. ADAMS (Rockwell International Corp.), and D. CLAY GREER (Rockwell International Corp.)

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29248**Vol. 12, No. 4, P. 43**

Mixture of benzotriazole, benzoic acid, and fungicide prevents growth of rust and fungus. Water-based cooling mixture made from readily available materials prevents formation of metallic oxides and growth of fungi in metallic pipes. Coolant remains clear and does not develop thick sludge tending to collect in low points in cooling systems with many commercial rust inhibitors. Coolant compatible with iron, copper, aluminum, and stainless steel. Cannot be used with cadmium or cadmium-plated pipes.

B88-10237
PHOTOCHROMIC POLYAPHRONS FOR VISUALIZATION OF FLOW

M. R. SUBBARAMAN (Rockwell International Corp.), and B. J. OSTERMIER (Rockwell International Corp.)

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29259 **Vol. 12, No. 4, P. 43**

Drops of ultraviolet-activated dyes encapsulated in liquid films reveal flow patterns. Method based on visualization material composed of polyaphrons containing photochromic dye. Polyaphrons are droplets of organic liquid encapsulated in thin layer of another liquid, which holds droplets stably by surface tension. Photochromic dye within a polyaphron acquires color temporarily after exposure to strong ultraviolet light.

B88-10238
FIRE-RETARDANT DECORATIVE INKS FOR AIRCRAFT INTERIORS

D. A. KOURTIDES, Z. NIR (Makhteshim, Ltd.), and J. A. MIKROYANNIDIS (University of Patras)

Apr. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-18441)

ARC-11729 **Vol. 12, No. 4, P. 44**

Report describes testing of commercial and experimental fire retardants for incorporation into acrylic printing inks used on aircraft-interior sandwich panels. Films of acrylic ink containing fire-retardant additives prepared by casting on glass plates. Solvent evaporated in vacuum, cast films cured at 80 to 100 degree C for 30 minutes in air-circulating oven. Thermochemical properties of films examined by thermogravimetric analysis and differential scanning calorimetry (DSC). Samples of inks cast on sheets of polyvinylfluoride (PVF), and their limiting oxygen indices and smoke evolution measured.

B88-10239
LUBRICATION AND WEAR OF HOT CERAMICS

H. E. SLINEY, T. P. JACOBSON, D. DEADMORE, and K. MIYOSHI

Apr. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-25476)

LEW-14595 **Vol. 12, No. 4, P. 44**

Report presents results of experiments on tribological properties of ceramics. Describes friction and wear characteristics of some ceramics under consideration for use in gas turbines, diesel engines, and Stirling engines. Discusses formulation of composite plasma-sprayed ceramics containing solid lubricant additives, and data for carbide- and oxide-based composite coatings for use at temperatures up to at least 900 degree C.

B88-10240
ADHESIVES FOR USE IN VACUUM, RADIATION, AND COLD

FRANK L. BOUQUET (Caltech)
 Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17034 **Vol. 12, No. 4, P. 45**

Report presents results of literature searches and tests of eight adhesives for use in high-radiation, low-temperature, vacuum environment of Galileo spacecraft mission to Jupiter. Used as bonding agents for thermal blankets, instruments, structural members, and coatings. Adhesives tested for contamination, reflectance, bond integrity, color, transmittance, outgassing, dielectric constant, coefficient of thermal expansion, optical interference, peel strength, and shear strength. Some of tests conducted at temperature of liquid nitrogen (-150 degree C).

B88-10241
DESIGNING CERAMIC COATINGS

G. McDONALD, R. C. HENDRICKS, R. L. MULLEN (Case Western Reserve University), J. PADOVAN (University of Akron), M. J. BRAUN (University of Akron), and B. T. F. CHUNG (University of Akron)

Apr. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-25726)

LEW-14545 **Vol. 12, No. 4, P. 46**

Report summarizes design of ceramic coats for metal parts in heat engines. Ceramic coat used to reduce transfer of heat from hot gas to cylinder wall, piston, turbine blade, or other internally-cooled metal part. Enables use of higher gas temperatures needed for higher efficiencies, permits use of less cooling air, or extends life of metal part by reducing temperature.

B88-10242
CERAMIC THERMAL BARRIERS FOR DIRTY-FUEL TURBINES

ROBERT A. MILLER
 Apr. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-22687)

LEW-14596 **Vol. 12, No. 4, P. 46**

Report discusses performances of ceramic thermal-barrier coating materials for use in electric-utility gas-turbine engines. Variations of standard coating evaluated in search for coating resistant to dirty fuel. Variations included alterations of level of yttria, replacement of yttria by other stabilizers, controlling surface density (by plasma spray processing, infiltration, laser glazing, or sputtering), and interface treatments.

B88-10243
SILICONES AS CONNECTOR-POTTING COMPOUNDS

FRANK L. BOUQUET (Caltech), and MARJORIE S. BICKLER (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17251 **Vol. 12, No. 4, P. 46**

Report evaluates silicone potting materials for electrical connectors. Describes tests of connector specimens made with CV-2510 and DC-6-1104 silicones with dibutyl tin dilaurate catalyst and evaluates test results in light of previously published test results for polyurethanes. Discusses requirements for connector-potting materials, methods used to evaluate silicones, techniques for preparing specimens, and results of tests. Identifies commercial sources of silicone potting materials.

B88-10284
EXTENDING FATIGUE LIVES OF SELECTED ALLOYS

D. E. MATEJCZYK (Rockwell International Corp.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27131 **Vol. 12, No. 5, P. 48**

Rejuvenating treatments demonstrated. Experiments with three alloys show some combinations of heat treatment, hot isostatic pressing, and/or surface treatment extends cycle lives of fatigue-damaged or fatigue-precracked specimens. For each alloy, tests were first done to determine 'baseline' high-cycle-fatigue lives and high-cycle-fatigue failure modes over range of test conditions. Controlled fatigue damage introduced into specimens. Damaged specimens subjected to candidate rejuvenating treatments, then tested to failure. Effectiveness of each treatment judged by comparing fatigue data of damaged and treated specimens to 'baseline' fatigue and data taken at same test conditions.

B88-10285
ELECTROCHROMIC VARIABLE-EMISSIVITY SURFACES

R. DAVID RAUH (EIC Laboratories, Inc.), and STUART F. COGAN (EIC Laboratories, Inc.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26032

Vol. 12, No. 5, P. 48

Temperature controlled by altering infrared radiative properties. Infrared emissivity of electrochromically active layer changed by applying voltage to insert or remove Li atoms electrochemically. Change reversible and continuously variable between specified limits of layered structure.

B88-10286

PMR COMPOSITES OF INCREASED TOUGHNESS

RAYMOND D. VANNUCCI, and KENNETH J. BOWLES

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N85-32148)

LEW-14574

Vol. 12, No. 5, P. 49

Toughness increased without sacrificing processability or hot strength. Resin composition provides best overall balance of composite toughness and retention of mechanical properties at 600 degree F (316 degree C) with processability obtained by substituting 20 mole percent of diamine used in PMR-15 resins with diamine containing twice number of flexible phenyl connecting groups.

B88-10287

HIGH-EMISSION COATINGS FOR HIGH-TEMPERATURE SURFACES

WILLIAM D. DEININGER (Caltech), and DAVID Q. KING (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17122

Vol. 12, No. 5, P. 50

Plasma-sprayed coatings increase cooling by thermal radiation. Coating of zirconium diboride on tungsten or molybdenum increases emissivity of surface to more than 0.6 at 2,000 degree C. Applied by plasma-arc spraying after surface cleaned and roughened to ensure adhesion.

B88-10288

HYDROGEN/AIR-IGNITION TORCH

GEORGE A. REPAS

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-13470)

LEW-14552

Vol. 12, No. 5, P. 50

Torch is simple, reliable, and economical. Airflow cools inner tube prior to flowing through openings in inner tube and mixing with gaseous hydrogen. Spark plug connected to constant-duty simple ignition transformer threaded into side of torch and into inner tube. Transformer used to excite spark plug for period long enough to ignite gas. Transformer is turned off.

B88-10289

READILY PROCESSABLE POLYIMIDE

PAUL M. HERGENROTHER, FRANK W. HARRIS (University of Akron), and MARK W. BELTZ (University of Akron)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13675

Vol. 12, No. 5, P. 50

Polymer exhibits resistance to hydraulic fluid, excellent processability, and extremely high adhesive strength. Synthesis involves reaction of new diamine, 1,3-bis 2-ethyl ether, with 3,3',4,4'-benzophenonetetracarboxylic dianhydride to form polyamic acid and subsequent conversion to polyimide.

B88-10290

PROCESS MAKES HIGH-GRADE SILICON

RUDOLF KELLER (EMEC Consultants)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21323

Vol. 12, No. 5, P. 55

Reactants and electrolyte recycled to yield relatively pure product. Process based on reaction of silicon dioxide with aluminum. Aluminum for process taken from operating aluminum-electrolysis cell, and Al₂O₃ product returned to same cell. Aluminum continually recycled and purified, and purity of silicon high as well.

B88-10345

ULTRASONIC DETERMINATION OF RECRYSTALLIZATION

EDWARD R. GENERAZIO

Jun. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-10399)

LEW-14581

Vol. 12, No. 6, P. 70

State of recrystallization identified. Measurement of ultrasonic attenuation shows promise as means of detecting recrystallization in metal. Technique applicable to real-time acoustic monitoring of thermomechanical treatments. Starting with work-hardened material, one ultrasonically determines effect of annealing, using correlation between ultrasonic attenuation and temperature.

B88-10376

HALOGENATION ENHANCES CARBON-FIBER/EPOXY COMPOSITES

DONALD A. JAWORSKE, RAYMOND D. VANNUCCI, and REZA ZINOLABEDINI (Cleveland State University)

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14584

Vol. 12, No. 7, P. 48

Interlaminar shear strength increased by inexpensive treatment. New surface treatment for carbon fibers enhances interlaminar shear strength, ILSS, without altering tensile strength significantly. Exposure of polyacrylonitrile-based T-300, or equivalent, fibers to bromine vapor at room temperature improves ILSS of epoxy composites made from these fibers by 30 percent. Enhanced ILSS obtained from halogenation of carbon fibers beneficial in many aerospace and terrestrial applications.

B88-10377

GRAPHITE/EPOXY DEICING HEATER

CHING-CHEH HUNG, MICHAEL E. DILLEHAY (Cleveland State University), and MARK STAHL (Cleveland State University)

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-12559)

LEW-14551

Vol. 12, No. 7, P. 48

Heat applied close to surface protected. One ply of highly electrically- and thermally-conductive brominated-graphite fiber composite laminated between two plies of electrically-insulating composite material, with michel foil making contact with end portions of graphite fibers. Part of foil exposed beyond composite to serve as electrical contact. Graphite/Epoxy composite heater developed to prevent and reverse formation of ice on advanced composite surfaces of aircraft.

B88-10378

METAL/CERAMIC BOND COATINGS FOR HIGH TEMPERATURES

ROBERT A. MILLER, and GEORGE W. LEISSLER (Sverdrup Technology, Inc.)

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14541

Vol. 12, No. 7, P. 51

04 MATERIALS

Reduced-thermal-expansion bond coatings developed for use at high temperatures in thermal-barrier-coating systems. Bond coatings composed of low-pressure-plasma-sprayed metallic matrices dispersed with low-thermal-expansion high-bulk-modulus ceramic particles. New coatings and application lower thermal-expansion-mismatch strain while maintaining integrity at high temperatures.

B88-10379

WEAR-RESISTANT, THERMALLY CONDUCTIVE COATING

BRIAN J. EDMONDS, GEORGE W. LEISSLER (Sverdrup Corp.), and WILLIAM J. WATERS (Waters and Associates)

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14562

Vol. 12, No. 7, P. 51

Process makes coating with unusual properties. Coating is copper or copper alloy with controlled dispersion of oxide or carbide particles. Process results in coating that has thermal expansion similar to base material, increased resistance to abrasion when hot, and high thermal conductivity. Coatings resistant to wear used in variety of applications ranging from earth-moving equipment to space vehicles.

B88-10380

AUTOMATIC REPLENISHMENT OF DOPANT IN SILICON GROWTH

E. L. KOCHKA (Westinghouse Electric Corp.)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17138

Vol. 12, No. 7, P. 52

Dopant incorporated feed pellets to maintain required concentration. Technique of continuous replenishment of dopant in silicon melt helps ensure correct resistivity in solid silicon grown from melt. Technique used in dendritic-web growth process in which ribbon of silicon continuously pulled from molten material. Providing uniform doping and resistivity in ribbon technique enables production of high-quality silicon ribbon at high yields for use in semiconductor devices.

B88-10416

IMPROVED 'GREEN' FORMING OF SILICON NITRIDE

MARC R. FREEDMAN, WILLIAM A. SANDERS, and JAMES D. KISER

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14680

Vol. 12, No. 8, P. 54

Advanced processing techniques reduce incidence of critical flaws. Critical flaws reduced by processing of powders to avoid organic and metallic contamination and combination of colloidal techniques with innovative slurry-pressing technique avoiding agglomeration. Silicon nitride considered for many applications ranging from components of turbine engines to industrial heat exchangers.

B88-10417

ANNEALING REDUCES FREE VOLUMES IN THERMOPLASTICS

JAG J. SINGH, and TERRY L. ST. CLAIR

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13664

Vol. 12, No. 8, P. 54

Investigation conducted to determine free volumes and water-absorption characteristics of two types of thermoplastic polyimide as functions of annealing histories. Reductions reach asymptotic values after several annealing cycles. High-temperature thermoplastics excellent candidates for use in aerospace

applications. Graphite-fiber composites containing thermoplastic matrices have wide applicability.

B88-10418

ARTIFICIAL VOIDS IN CERAMIC MATERIALS

DON J. ROTH, EDWARD R. GENERAZIO, and GEORGE Y. BAAKLINI

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-31913)

LEW-14586

Vol. 12, No. 8, P. 56

Method for creating voids in ceramic specimens developed. Silicon carbide and silicon nitride are high-temperature structural ceramic materials considered for applications in advanced gas-turbine engines. Ability to detect and characterize voids (by sizes, shapes, and locations) in structural ceramics vital for increasing strengths and reliabilities of materials. Small holes made deliberately to help quantify techniques of nondestructive evaluation.

B88-10419

STABILIZING PFAE AGAINST OXIDATION

W. R. JONES, JR., K. PACIOREK (Ultrasystems), and R. KRATZER (Ultrasystems)

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-25474)

LEW-14612

Vol. 12, No. 8, P. 56

Process makes commercial perfluoroalkylether (PFAE) hydraulic fluid more stable in presence of metals in hot oxidizing atmospheres. Consists of thermal oxidation in presence of catalyst to remove weak links, followed by transformation of newly-created functional groups into phospho-s-triazine linkages, which impart antioxidation and anticorrosion properties. A 66-percent yield of stable PFAE obtained. Fluid used as lubricant, grease, or hydraulic fluid at temperatures from -55 to +300 degree C in presence of metals in oxidizing atmosphere.

B88-10420

ORGANOBOROSILANE POLYMERS AND CERAMIC PRODUCTS

SALVATORE R. RICCITIELLO, MING-TA HSU (H. C. Chem Research and Service Corp.), and TIMOTHY S. CHEN (H. C. Chem Research and Service Corp.)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11649

Vol. 12, No. 8, P. 58

Process developed to make polyorganoborosilane polymers. Precursor polymers prepared by using alkali metal to couple boron halide with organohalosilane. In representative application, polymer drawn into fibers, then pyrolyzed to produce ceramic cloth. Ceramics exhibit high thermo-oxidative stability.

B88-10421

DRY PMR-15 RESIN POWDERS

RAYMOND D. VANNUCCI, and GARY D. ROBERTS

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14573

Vol. 12, No. 8, P. 58

Shelf lives of PMR-15 polyimides lengthened. Procedure involves quenching of monomer reactions by vacuum drying of PRM-15 resin solutions at 70 to 90 degree F immediately after preparation of solutions. Absence of solvent eliminates formation of higher esters and reduces formation of imides to negligible level. Provides fully-formulated dry PMR-15 resin powder readily dissolvable in solvent at room temperature immediately before use. Resins used in variety of aerospace, aeronautical, and commercial applications.

B88-10422**POWDER-METALLURGY PROCESS AND PRODUCT**

HENRY G. PARIS (Aluminum Co. of America)

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20406)

LAR-13451**Vol. 12, No. 8, P. 60**

Rapid-solidification processing yields alloys with improved properties. Study undertaken to extend favorable property combinations of I/M 2XXX alloys through recently developed technique of rapid-solidification processing using powder metallurgy(P/M). Rapid-solidification processing involves impingement of molten metal stream onto rapidly-spinning chill block or through gas medium using gas atomization technique.

B88-10423**EFFECTS OF RADIATION ON ELASTOMERS**

FRANK L. BOUQUET (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16747**Vol. 12, No. 8, P. 60**

Report provides data on effects of radiation on elastomers. Quantifies effects by giving minimum radiation levels to induce changes of 1 percent and 25 percent in given properties. Electrical, mechanical, and chemical properties included in data. Combined effects of heat and radiation briefly considered. Data summarized in graphic form useful to designers.

B88-10424**CHOOSING AN ALLOY FOR AUTOMOTIVE STIRLING ENGINES**

JOSEPH R. STEPHENS

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-20541)

LEW-14609**Vol. 12, No. 8, P. 61**

Report describes study of chemical compositions and microstructures of alloys for automotive Stirling engines. Engines offer advantages of high efficiency, low pollution, low noise, and ability to use variety of fuels. Twenty alloys evaluated for resistance to corrosion permeation by hydrogen, and high temperature. Iron-based alloys considered primary candidates because of low cost. Nickel-based alloys second choice in case suitable iron-based alloy could not be found. Cobalt-based alloy included for comparison but not candidate, because it is expensive strategic material.

B88-10482**NUMERICAL ANALYSIS OF INTERLAMINAR-FRACTURE TOUGHNESS**

C. C. CHAMIS, and P. L. N. MURTHY (Cleveland State University)

Oct. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-14316)

LEW-14590**Vol. 12, No. 9, P. 66**

Finite-element analysis applied in conjunction with strain-energy and micromechanical concepts. Computational procedure involves local, local-crack-closure, and/or the 'unique' local-crack-closure method developed at NASA Lewis Research Center, for mathematical modeling of ENF and MMF. Methods based on three-dimensional finite-element analysis in conjunction with concept of strain-energy-release rate and with micromechanics of composite materials. Assists in interpretation of ENF and MMF fracture tests performed to obtain fracture-toughness parameters, by enabling evaluation of states of stress likely to induce interlaminar fractures.

B88-10483**DEVELOPING CRYSTALLINITY IN LINEAR AROMATIC POLYIMIDES**

TERRY L. ST. CLAIR

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13732**Vol. 12, No. 9, P. 67**

New technique improves melt flow of polyimide. Uses chemical imidization or cyclodehydration techniques that do not cause significant decrease in molecular weight. Process involves dissolution of polyamide acid in amide solvent or mixture of ether and amide solvent at low percentage of solids followed by treatment of this solution with aprotic organic base, such as triethylamine or pyridine, for period of time prior to treatment with organic dehydrating agent. Latter treatments facilitates formation of polyimide. Useful for production of polyimide molding materials. Expected to have widespread application in preparation of easily processed adhesives, molding powders, and matrix resins.

B88-10484**COLD-WORKED INCONEL(R) 718 BARS**

J. W. MONTANO

Oct. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

MFS-27171**Vol. 12, No. 9, P. 68**

Cold working and double aging yield high strength without sacrifice of resistance to corrosion. Report presents data on mechanical properties and stress-corrosion resistance of triple-melted, solution-treated, work-strengthened, direct-double-aged Incone(R) 718 alloy. Triple melting consists of vacuum induction melting, electro-slag remelting, and vacuum arm remelting. Data indicate advance in processing of large-diameter bars. New process increases yield strength without reducing the elongation, reduction of area, and grain size.

B88-10485**ACROLEIN MICROSPHERES ARE BONDED TO LARGE-AREA SUBSTRATES**

ALAN REMBAUM (Caltech), and RICHARD C. K. YEN (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15635**Vol. 12, No. 9, P. 68**

Reactive cross-linked microspheres produced under influence of ionizing radiation in aqueous solutions of unsaturated aldehydes, such as acrolein, with sodium dodecyl sulfate. Diameters of spheres depend on concentrations of ingredients. If polystyrene, polymethylmethacrylate, or polypropylene object immersed in solution during irradiation, microspheres become attached to surface. Resulting modified surface has grainy coating with reactivity similar to free microspheres. Aldehyde-substituted-functional microspheres react under mild conditions with number of organic reagents and with most proteins. Microsphere-coated microspheres or films used to immobilize high concentrations of proteins, enzymes, hormones, viruses, cells, and large number of organic compounds. Applications include separation techniques, clinical diagnostic tests, catalytic processes, and battery separators.

B88-10524**BIPHASE METAL ELECTRODES FOR AMTEC**

R. WILLIAMS (Caltech), C. BANKSTON (Caltech), T. COLE (Caltech), S. KHANNA (Caltech), B. JEFFRIES-NAKAMURA (Caltech), and B. WHEELER (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16787**Vol. 12, No. 10, P. 50**

04 MATERIALS

New biphasic metal electrodes for alkali metal thermoelectric converter (AMETEC) exhibit low electrical resistance, fast alkali metal transport, and good power densities and lifetime at operating temperatures from 1,100 to 1,160 K. Electrodes expected to last as long as 10,000 h in service without significant degradation. Made of two refractory metals, one forms strong bonds with sodium, other inert to sodium.

B88-10525

IMPROVED ALUMINIZED MULTILAYER INSULATION

EDWARD H. TEPPER (United Technologies Corp.)

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21259

Vol. 12, No. 10, P. 51

In blanket of insulating material, layers of aluminized Mylar polyethylene terephthalate separated by spacers cause multiple reflections of thermal radiation and impede passage of radiation through blanket. Insulating quality of blanket proportional to number of functional aluminized radiation-shield surfaces in assembly.

B88-10526

ADDITIVES IMPROVE PROCESSING OF POLYIMIDES

TERRY L. ST. CLAIR, HAROLD D. BURKS, DIANE M. STOAKLEY, and J. RICHARD PRATT (PRC Kentron, Inc.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13669

Vol. 12, No. 10, P. 51

Melt-processable polyimides maintain desirable polymer properties prepared by adding small amounts of certain low-molecular-weight, thermally stable additives. Useful in preparing void-free polyimide composites from higher flow resins that wet out fibers at lower processing temperatures. Applied to preparing high-temperature polyimide adhesives allowing enhanced wetting of adherends and ultimately better adhesion. Improvement to processing polyimides and potential application for production of films, coatings, adhesives, and composites.

B88-10527

PROCESSABLE AROMATIC POLYIMIDE THERMOPLASTIC BLENDS

ROBERT M. BAUCOM, NORMAN J. JOHNSTON, TERRY L. ST. CLAIR, JAMES B. NELSON, JOHN R. GLEASON, and K. MASON PROCTOR

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13695

Vol. 12, No. 10, P. 52

Method developed for preparing readily-processable thermoplastic polyimides by blending linear, high-molecular-weight, polyimic acid solutions in ether solvents with ultrafine, semicrystalline, thermoplastic polyimide powders. Slurries formed used to make prepregs. Consolidation of prepregs into finished composites characterized by excellent melt flow during processing. Applied to film, fiber, fabric, metal, polymer, or composite surfaces. Used to make various stable slurries from which prepregs prepared.

B88-10528

SIZING INCREASES FIBER/MATRIX ADHESION

MUZAFFER CIZMECIOGLU (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16975

Vol. 12, No. 10, P. 53

Strengths of graphite fiber/polycarbonate matrix composites increased by precoating fibers with thin layer of polycarbonate. Flexural strengths of composite samples measured to determine effects of different fabrication conditions.

B88-10529

OXIDATION-RESISTANT SURFACES FOR SOLAR REFLECTORS

DANIEL A. GULINO, ROBERT A. EGGER (Cleveland State University), and WILLIAM F. BANHOLZER (General Electric Co.)
Nov. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-10960)

LEW-14636

Vol. 12, No. 10, P. 54

Thin films on silver provide highly-reflective, corrosion-resistant mirrors. Study evaluated variety of oxidation-resistant reflective materials for use in solar dynamic power system, one that generates electricity by focusing Sunlight onto receiver of heat engine. Thin films of platinum and rhodium deposited by ion-beam sputtering on various substrate materials. Solar reflectances measured as function of time of exposure to radio-frequency-generated air plasma. Several protective coating materials deposited on silver-coated substrates and exposed to plasma. Analyzed before and after exposure by electron spectroscopy for chemical analysis and by Auger spectroscopy.

B88-10530

HYDROGEN EMBRITTLEMENT AND STACKING-FAULT ENERGIES

R. A. PARR, M. H. JOHNSON, J. H. DAVIS, and T. K. OH

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27114

Vol. 12, No. 10, P. 54

Embrittlement in Ni/Cu alloys appears related to stacking-fault probabilities. Report describes attempt to show a correlation between stacking-fault energy of different Ni/Cu alloys and susceptibility to hydrogen embrittlement. Correlation could lead to more fundamental understanding and method of predicting susceptibility of given Ni/Cu alloy from stacking-fault energies calculated from X-ray diffraction measurements.

B88-10584

FIBERS AND COMPOSITES DERIVED FROM SILSESQUOXANES

FRANCES I. HURWITZ, LIZBETH H. HYATT, LISA DAMORE, A., and JOY P. GORECKI

Dec. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-25432)

LEW-14566

Vol. 12, No. 11, P. 54

In new method, silsesquioxane powders blended to control ratio of carbon to silicon. Powders melted, and excess silanol groups condense with evolution of water. When melt attains suitable viscosity, extruded into fibers through die or drawn into fibers from melt at uniform rate. Fibers cured and heat treated. Enables easy fabrication of thermally stable fibers from inexpensive silsesquioxane precursors. Impregnation of fibers and preforms without solvent minimizes both shrinkage and formation of voids resulting from volatilization of trapped solvent.

B88-10585

IMPROVED CONSOLIDATION OF SILICON CARBIDE

MARC R. FREEDMAN, and MICHAEL L. MILLARD (General Electric Co.)

Dec. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-24836)

LEW-14681

Vol. 12, No. 11, P. 54

Colloidal techniques used to improve dispersion and suspension of SiC in water. In combination with slurry pressing, resulted in increase in strength of sintered SiC by 87 percent over SiC sintered after dry pressing. Improvement due to reduced porosity and reflected in improved densities of 'green' and sintered specimens. Smaller sizes of pores, and reduced sizes of critical flaws contributed to increase in strength. Useful for making parts from particulate-, transformation-, and whisker-toughened ceramics and

monolithic ceramics. Provides avenue for study of variables contributing to reliability of current structural ceramics.

B88-10586**CENTRIFUGATION WOULD PURIFY MERCURIC IODIDE**

PAUL J. SHLICHTA (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16737

Vol. 12, No. 11, P. 56

Vapor-deposition, solution, and melting/freezing methods proposed. Three techniques described for purification of HgI₂ involving centrifugation.

B88-10587**DIFFUSION ANALYSIS OF HYDROGEN-DESORPTION MEASUREMENTS**

MERLIN D. DANFORD

Dec. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

MFS-27142

Vol. 12, No. 11, P. 59

Distribution of hydrogen in metal explains observed desorption rate. Report describes application of diffusion theory to analysis of experimental data on uptake and elimination of hydrogen in high-strength alloys of 25 degree C. Study part of program aimed at understanding embrittlement of metals by hydrogen. Two nickel-base alloys, Rene 41 and Waspaloy, and one ferrous alloy, 4340 steel, studied. Desorption of hydrogen explained by distribution of hydrogen in metal. 'Fast' hydrogen apparently not due to formation of hydrides on and below surface as proposed.

B88-10588**STRATEGIC MATERIALS FOR SUPERALLOYS**

JOSEPH R. STEPHENS

Dec. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-21077)

LEW-14665

Vol. 12, No. 11, P. 61

Report discusses status of strategic materials for superalloys in United States. Reviews trends in development of superalloys, defines 'strategic' materials, summarizes state of U.S. resources and reserves, and discusses sources and availability of supplies. Reviews results of Conservation of Strategic Aerospace Materials (COSAM) program.

B89-10021**ACETYLENE-TERMINATED ASPARTIMIDES AND DERIVED RESINS**

PAUL M. HERGENROTHER, JOHN W. CONNELL (Virginia Commonwealth University), and STEPHEN J. HAVENS (PRC Kentron, Inc.)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13730

Vol. 13, No. 1, P. 40

New polymers and derived blends exhibit improved processability and properties. New toughened epoxies exhibit excellent properties, but use temperatures limited. Bismaleimide resins are some base materials formulated to develop materials having moderate use temperatures. Work conducted on use of acetylenic (ethynyl) group to cross-link and extend chains of oligomers and polymers to obtain materials to perform at higher temperatures. Extended to include acetylene-terminated aspartimides (ATA's).

B89-10022**DETECTING RESIDUES ON GRIT-BLASTED SURFACES**

H. L. NOVAK (United Technologies Corp.), and L. M. ZOOK (United

Technologies Corp.)

Jan. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28276

Vol. 13, No. 1, P. 40

Addition of fluorescent or iridescent material to plastic grit particles proposed for detection of grit residues after grit-blast cleaning. Residual films visible by observing grit-blasted surfaces under infrared or ultraviolet light. Plastic grit contains fluorescent or iridescent additive in core and coating. Wherever grit material becomes embedded, additive makes it visible under infrared or ultraviolet light. Applicable to other grit materials, for example fluorescent or iridescent materials added to particles of glass, silicon carbide, aluminum oxide, or zirconium silicate.

B89-10023**LOW-DIELECTRIC POLYIMIDES**

ANNE K. ST. CLAIR, TERRY L. ST. CLAIR, WILLIAM P. WINFREE, and BERT R. EMERSON, JR.

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13769

Vol. 13, No. 1, P. 41

New process developed to produce aromatic condensation polyimide films and coatings having dielectric constants in range of 2.4 to 3.2. Materials better electrical insulators than state-of-the-art commercial polyimides. Several low-dielectric-constant polyimides have excellent resistance to moisture. Useful as film and coating materials for both industrial and aerospace applications where high electrical insulation, resistance to moisture, mechanical strength, and thermal stability required. Applicable to production of high-temperature and moisture-resistance adhesives, films, photoresists, and coatings. Electronic applications include printed-circuit boards, both of composite and flexible-film types and potential use in automotive, aerospace, and electronic industries.

B89-10024**ULTRA-HIGH-MOLECULAR-WEIGHT****SILPHENYLENE/SILOXANE ELASTOMERS**

N. H. HUNDLEY, and W. J. PATTERSON

Jan. 1989 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

MFS-27120

Vol. 13, No. 1, P. 42

Elastomers enhance thermal and mechanical properties. Capable of performing in extreme thermal/oxidative environments and having molecular weights above 10 to the sixth power prepared and analyzed in laboratory experiments. Made of methylvinylsilphenylene-siloxane terpolymers, new materials amenable to conventional silicone-processing technology. Similarly formulated commercial methyl-vinyl silicones, vulcanized elastomers exhibit enhance thermal/oxidative stability and equivalent or superior mechanical properties.

B89-10065**FLUOROPOXY ADHESIVES BOND FLUOROPLASTICS**

SHENG YEN LEE

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13072

Vol. 13, No. 2, P. 56

Etching or other special preparation unnecessary. Experiments show fluoroepoxy compounds of high fluorine content adhere to fluoroplastics, without prior etching or other treatment of fluoroplastic surfaces. Compounds mixed with each other in approximately stoichiometric amounts and react to produce fluoroepoxy compounds adhering to fluoroplastics. Advantageous in bonding polymers having fluorine contents of 55 percent or more.

04 MATERIALS

B89-10066

SOLUBLE AROMATIC POLYIMIDES FOR FILM COATING

ANNE K. ST. CLAIR, and TERRY L. ST. CLAIR

Feb. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16911)

LAR-13700

Vol. 13, No. 2, P. 56

Because of toughness, flexibility, and remarkable thermal stability, linear all-aromatic polyimides excellent candidate film and coating materials for advanced electronic circuitry and wires. Study determined effects on solubility of changing isomeric points of attachment of phenoxy units in diamine portions of several all-aromatic polyimides. Tough, flexible, transparent films produced by thermally converting polyamic acids to polyimides at 300 degree C in air. Potential for electronic applications excellent.

B89-10067

FLEXIBLE, POLYMER-FILLED METALLIC CONDUCTORS

BRUCE A. BANKS, and DIANE M. SWEC

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14161

Vol. 13, No. 2, P. 57

Procedure developed to make materials both flexible and reasonably good electrical conductors. Metal or polymer sheet substrate cleaned with beam of energetic inert-gas ions to remove adsorbed gases and contaminants from surface. After cleaning, substrate coated by cosputter deposition of both conductive metal and flexible polymer. Removed by either mechanical or chemical-dissolution technique, and resulting flexible metal/polymer conductor bonded at low temperature to conductor-surface contacts.

B89-10068

LOW-THERMAL-EXPANSION FILLED POLYTETRAFLUOROETHYLENE

SANFORD S. SHAPIRO (Hughes Aircraft Co.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17189

Vol. 13, No. 2, P. 60

PTFE made thermally compatible with aluminum without changing dielectric constant. Manufactured with fillers and pores to reduce coefficient of thermal expansion by factor of 6 to match aluminum. Material retains 2.1 dielectric constant of pure PTFE. Combines filler and micropore concepts. Particles and voids embedded in PTFE matrix function cooperatively. Particles take up compressive stress imposed by contracting PTFE, and voids take up expanding material. Increases dielectric constant, while voids reduce it.

B89-10069

POLYMER COATINGS REDUCE ELECTRO-OSMOSIS

BLAIR J. HERREN, ROBERT SNYDER, STEVEN G. SHAFER (University of Alabama), J. MILTON HARRIS (University of Alabama), and JAMES M. VAN ALSTINE (Universities Space Research Association)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26050

Vol. 13, No. 2, P. 62

Poly(ethylene glycol) film controls electrostatic potential. Electro-osmosis in quartz or glass chambers reduced or reversed by coating inside surface of chambers with monomacromolecular layers of poly(ethylene glycol). Stable over long times. Electrostatic potential across surface of untreated glass or plastic chamber used in electro-phoresis is negative and attracts cations in aqueous electrolyte. Cations solvated, entrains flow of electrolyte migrating toward cathode. Electro-osmotic flow interferes with desired electrophoresis of particles suspended in electrolyte. Polymer coats nontoxic, transparent, and neutral, advantageous for use in electrophoresis.

B89-10070

MAKING SINGLE CRYSTALS OF B4C

ROBERT S. FEIGELSON (Stanford University)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17255

Vol. 13, No. 2, P. 62

Crystals precipitate from solution in copper. Well-defined single crystals of boron carbide (B4C) grown by slowly cooling melts containing B4C and copper. Forms on surface and in interior of melt.

B89-10071

IMPROVING THERMOELECTRIC PROPERTIES OF (SI/GE)/GAP ALLOYS

JAN W. VANDERSANDE (Caltech), CHARLES WOOD (Caltech), and SUSAN DRAPER (Lewis Research Center)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17259

Vol. 13, No. 2, P. 63

Annealing in steps increases figure of merit. Carefully-controlled heat treatment increases thermoelectric figure of merit of hot-pressed GaP-doped Si/Ge alloy.

B89-10123

ACOUSTICAL IMAGING OF DEFECTS IN CERAMICS

EDWARD R. GENERAZIO, DON J. ROTH, and GEORGE Y. BAAKLINI

Mar. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-15257)

LEW-14747

Vol. 13, No. 3, P. 60

Because of their brittle nature, ceramics are extremely sensitive to even slight variations in microstructure. Direct observations show importance of kinds of defects by identifying them as sites of localized failures. Sites cannot be determined priori by optical and x-ray methods. Color images obtained from precise acoustic measurements reveal subtle variations in porosity fractions and mean sizes of pores in ceramics. Velocity and attenuation of ultrasound found related directly to density and mean size of pores, respectively.

B89-10124

NONAGGREGATING MICROSPHERES CONTAINING ALDEHYDE GROUPS

ALAN REMBAUM (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15459

Vol. 13, No. 3, P. 60

Cobalt gamma irradiation of hydrophilic monomers in presence of acrolein yields exceptionally-stable, nonaggregating microspheres. Mixtures of 2-hydroxyethyl methacrylate (HEMA) and acrolein form homogeneous solutions in distilled water containing 0.4 percent polyethylene oxide (PEO). After deaeration with nitrogen, mixtures irradiated at room temperature with gamma rays from cobalt source; total exposure time 4 hours, at rate of 0.2 milliroentgen per hour. Reaction product centrifuged three times for purification and kept in distilled water.

B89-10125

CALCULATING DYNAMIC SHEAR MODULI OF POLYMERS

CARLETON J. MOORE

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28340

Vol. 13, No. 3, P. 62

Improved nonlinear mathematical model developed to fit

experimental data on relaxation of stresses in viscoelastic materials. Developed specifically to study shear moduli of rubbery solid rocket propellants, also used to characterize polymers in general, other viscoelastic materials, and composites of viscoelastic materials. Facilitates and improves accuracy of analysis and numerical simulation of mechanical behavior of structural components (for example, tires) made of such materials.

B89-10126**MULTIPLE-PURPOSE RIGID FOAM INSULATION**

MATTHEW T. LIU (Martin Marietta Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28264

Vol. 13, No. 3, P. 62

Plastic foam promises to serve as multiple-purpose thermal insulation. Material is rigid, closed-cell, thermally stable foam or urethane-modified isocyanate. Made by reacting polyol mixture with polymeric diphenyl methane diisocyanate in presence of catalyst and fluoro-carbon blowing agent. Properties customized for particular application by adjusting proportions of ingredients in polyol mixture.

B89-10127**POLYMER LUBRICANTS FOR USE IN VACUUM**

ROBERT L. FUSARO

Mar. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17906)

LEW-14661

Vol. 13, No. 3, P. 63

Report describes tests of lubricating properties of 10 polymer-based materials - in particular, polyimides - in vacuum. Commercially available materials, in forms of solid bodies and films on metals, were tested on pin-on-disk apparatus in vacuum. Best low-wear, low-friction material was 80 PMDA/20 BTDA solid-body polyimide. Friction and wear properties of most polyimides so good in vacuum that solid-lubricant additives not necessary.

B89-10177**ALUMINA-ENHANCED THERMAL BARRIER**

MARNELL SMITH, DAN LEISER, and HOWARD GOLDSTEIN

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12135

Vol. 13, No. 4, P. 78

Rigid, fibrous ceramic tile material called 'alumina-enhanced thermal barrier' (AETB) extends temperature capability of insulating materials. Material has obvious potential for terrestrial use in kilns, furnaces, heat engines, and other applications in which light weight and high operating temperature are specified. Three kinds of ceramic fibers are blended, molded, and sintered to make refractory tiles.

B89-10178**BETTER PFAE'S FROM DIRECT FLUORINATION**

W. R. JONES, JR., and T. R. BIRSCHENK (Exfluor Research Corp.)

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-25475)

LEW-14613

Vol. 13, No. 4, P. 80

New low-molecular-weight perfluoroalkylethers (PFAE's) synthesized by direct fluorination in experimental study. Correlated viscosity and oxidation characteristics of PFAE's with structures to evaluate suitability as high-temperature lubricants and hydraulic fluids. Direct fluorination process attractive because it often involves single-step reaction and uses cheap starting materials. Versatile: produces highly branched ethers as well as polyethers containing more than two sequential carbon atoms in polymer chains. Such molecules cannot be made by conventional techniques.

B89-10179**ADDITIVES LOWER PICKUP OF MOISTURE BY POLYIMIDES**

TERRY L. ST. CLAIR, JAG J. SINGH, and J. RICHARD PRATT (Planning Research Corp.)

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-12614)

LAR-13679

Vol. 13, No. 4, P. 80

Series of new polyimide-processing additives decrease free volume and pickup of moisture in new 422 copolyimide. Physical properties of several copolyimides synthesized from linear BDSDA/ODA/MPD homopolymers investigated previously, by positron-annihilation spectroscopy, with results indicating copolyimides have unique transition molecular structure characterized by higher electron densities and stronger bonds. Transition structure permits both physical and chemical entry of water molecules into it.

B89-10180**METAL OXIDE/ZEOLITE COMBINATION ABSORBS H₂S**

GERALD E. VOECKS (Caltech), and PRAMOD K. SHARMA (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17099

Vol. 13, No. 4, P. 81

Mixed copper and molybdenum oxides supported in pores of zeolite found to remove H₂S from mixture of gases rich in hydrogen and steam, at temperatures from 256 to 538 degree C. Absorber of H₂S needed to clean up gas streams from fuel processors that incorporate high-temperature steam reformers or hydrodesulfurizing units. Zeolites chosen as supporting materials because of their high porosity, rigidity, alumina content, and variety of both composition and form.

B89-10181**CDO PRETREATMENT FOR GRAPHITE LUBRICANT FILMS**

ROBERT L. FUSARO

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-25473)

LEW-14635

Vol. 13, No. 4, P. 82

Lubrication of rubbing steel surfaces with graphite improved by sputtering cadmium oxide onto surfaces, according to report. Lubricating films consisting of mixtures of cadmium oxide and graphite did not perform as well as films of graphite alone on surfaces pretreated with cadmium oxide. Primary beneficial effect obtained by sputtering pretreatment with cadmium oxide, which apparently improves bond between metallic substrate and graphite.

B89-10182**DEGRADATION OF CARBON/PHENOLIC COMPOSITES BY NaOH**

H. M. KING, M. L. SEMMEL, B. E. GOLDBERG, and RAYMOND G. CLINTON, JR. (Georgia Inst. of Technology)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27099

Vol. 13, No. 4, P. 82

Effects of sodium hydroxide contamination level on physical and chemical properties of phenolic resin and carbon/phenolic composites described in report. NaOH degrades both carbon and phenolic components of carbon/phenolic laminates.

B89-10183**EFFECTS OF AGING ON EMBRITTLEMENT BY HYDROGEN**

D. H. LASSILA, and H. K. BIRNBAUM (University of Illinois)

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-26416)

ARC-11762

Vol. 13, No. 4, P. 83

04 MATERIALS

Report discusses study of grain-boundary fracture of hydrogen-charged nickel under conditions in which hydrogen is immobile. Thermally-charged nickel specimens aged at several temperatures for various periods of time to allow hydrogen to diffuse. Specimens then quenched and tested in liquid nitrogen (at temperature of 77 K) so distribution of hydrogen produced by aging maintained.

B89-10230 GRAPHITE FLUORIDE FIBER COMPOSITES FOR HEAT SINKING

CHING-CHEH HUNG, MARTIN LONG (Cleveland State Univ.), and MARK STAHL (Cleveland State Univ.)

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-26232)

LEW-14472 Vol. 13, No. 5, P. 54

Graphite fluoride fiber/polymer composite materials consist of graphite fluoride fibers in epoxy, polytetrafluoroethylene, or polyimide resin. Combines high electrical resistivity with high thermal conductivity and solves heat-transfer problems of many electrical systems. Commercially available in powder form, for use as dry lubricant or cathode material in lithium batteries. Produced by direct fluorination of graphite powder at temperature of 400 to 650 degree C. Applications include printed-circuit boards for high-density power electronics, insulators for magnetic-field cores like those found in alternators and transformers, substrates for thin-film resistors, and electrical-protection layers in aircraft de-icers.

B89-10231 GROWING GALLIUM ARSENIDE ON SILICON

GOURI RADHAKRISHNAN (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17360 Vol. 13, No. 5, P. 54

Epitaxial layers of high quality formed on $\langle 111 \rangle$ crystal plane. Present work reports successful growth of 1- and 2-micrometer thick layers of n-type, 7-ohms per cm, 2-inch diameter, Si $\langle 111 \rangle$ substrate. Growth conducted in Riber-2300(R) MBE system. Both doped and undoped layers of GaAs grown. Chamber equipped with electron gun and camera for in-situ reflection high-energy-electron diffraction measurements. RHEED patterns of surface monitored continuously during slow growth stage.

B89-10232 COMPUTING VISCOPLASTIC BEHAVIOR OF A MATERIAL

V. K. ARYA, and A. KAUFMAN

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23010)

LEW-14712 Vol. 13, No. 5, P. 56

Finite-element implementation developed for Robinson's unified model of viscoplasticity. Implemented via MARC general-purpose finite-element computer program by incorporating all of nonlinearity of material into initial load vector and treating vector as pseudo body force in finite-element equilibrium equations. In technique, each finite increment split into several equal subincrements, constitutive equations integrated by explicit Euler forward-difference method. HYPELA subroutine in MARC includes adaptive integration scheme selecting optimal sizes of subincrements. Spline function smooths discontinuous boundaries in Robinson's model to facilitate finite-element numerical calculations. Method used to calculate elastic, plastic, and creep deformations in solid materials at various temperatures; also used to study thermomechanical behavior of such things as hot pressure vessels and highly stressed components in engines.

B89-10233

SHATTER-RESISTANT, FLAME-RESISTANT WINDOW

WILLIAM R. RICHARDSON, and ERNIE D. WALKER

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-28880)

LEW-14743 Vol. 13, No. 5, P. 58

Combustion-chamber window combines properties of polycarbonate and sapphire. Inner layer of sapphire, withstands flame in chamber. Outer layer of polycarbonate tough but susceptible to weakening by flame and protected from flame by sapphire layer. Resists flames, shattering, and high pressure. Windows withstand 60 lb/in. to second power (414 kPa) in hydrostatic pressure vessel. Also survives leak test under internal pressure of 2 atm (0.2 MPa) of helium and external pressure of 10 to negative fifth power torr (1.3 mPa). Has transmission density of 0.08 to 0.11 in visible light. In contrast, unbonded layers have transmission density of 0.13 to 0.16.

B89-10234

TESTING BONDS BETWEEN BRITTLE AND DUCTILE FILMS

DONALD R. WHEELER, and HIROYUKI OHSAKI (Sony Magnetic Products, Inc.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14750 Vol. 13, No. 5, P. 59

Simple uniaxial strain test devised to measure intrinsic shear strength. Brittle film deposited on ductile substrate film, and combination stretched until brittle film cracks, then separates from substrate. Dimensions of cracked segments related in known way to tensile strength of brittle film and shear strength of bond between two films. Despite approximations and limitations of technique, tests show it yields semiquantitative measures of bond strengths, independent of mechanical properties of substrates, with results reproducible with plus or minus 6 percent.

B89-10235

DIPHENYLPOLYNYES FOR NONLINEAR OPTICAL DEVICES

ALBERT E. STIEGMAN (Caltech), JOSEPH W. PERRY (Caltech), and DANIEL R. COULTER (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17572 Vol. 13, No. 5, P. 60

Several diphenylpolyne compounds found to exhibit second-order nonlinear electric susceptibilities and chemical structures conducive to orientation in appropriate chemical environments. These features make new materials suitable for use in optical devices. Diphenylacetylene links give molecules rodlike characteristics making them amenable to orientation by suspension in liquid crystals. New molecules also have inherent liquid-crystalline properties enabling them to be oriented directly.

B89-10236

SURFACE HALOGENATION OF HIGH-TEMPERATURE SUPERCONDUCTORS

RICHARD P. VASQUEZ (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17712 Vol. 13, No. 5, P. 61

Surface halogenation experimental technique of postgrowth nonaqueous chemical processing of high-temperature superconductors. Research continues in use of technique to obtain superconducting and/or passivated surfaces, to etch bulk superconductors, and to make low-resistance electrical contacts. Most promising etchant is bromine dissolved in such polar nonaqueous solvents as alcohols, acetone, or ether. Etchant appears to act only on surface without adversely affecting superconducting bulk of film.

B89-10237**PILOT PLANT MAKES OXYGEN DIFLUORIDE**

MARSHALL F. HUMPHREY (Caltech), and EMIL A. LAWTON (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17347**Vol. 13, No. 5, P. 62**

Pilot plant makes oxygen difluoride highly-energetic, space-storable oxidizer not made commercially. Designed to handle reactants, product, and byproduct, most of which highly reactive, corrosive, and toxic. Oxygen difluoride evolves continuously from reactor containing potassium hydroxide in water at 10 degree C. Collection tanks alternated; one filled while other drained to storage cylinder. Excess OF₂ and F₂ dissipated in combustion of charcoal in burn barrel. Toxic byproduct, potassium fluoride, reacted with calcium hydroxide to form nontoxic calcium fluoride and to regenerate potassium hydroxide. Equipment processes toxic, difficult-to-make substance efficiently and safely.

B89-10238**DESIGN AND FABRICATION OF SUPERCONDUCTORS**

E. W. COLLINGS (Battelle Memorial Institute)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27029**Vol. 13, No. 5, P. 62**

Report reviews selected aspects of technology of superconductors, reflecting progress of recent decades ending in year 1982. Provides fairly comprehensive discussion of design and fabrication of conventionally and unconventionally processed composite superconductors made of alloys based on Ti/Nb and on A15 compounds. Review illustrated with 44 line drawings and 29 photographs and lists 245 references.

B89-10239**IMPROVING SILICON CARBIDE/SILICON NITRIDE FIBERS**

DAVID J. CROUSE (Tennessee Technological Univ.), and BENJAMIN G. PENN (Tennessee Technological Univ.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27101**Vol. 13, No. 5, P. 64**

Experiments described in report indicate properties of silicon carbide/silicon nitride fibers change significantly with modifications of monomeric precursors. Monomers polymerized by heating to temperatures above 500 degree C. Fibers drawn from resin melt under stream of dry nitrogen, cured in environmental chamber at 100 degree C and 95 percent relative humidity until unmeltable, then placed under tension and pyrolyzed at 1,200 to 1,500 degree C to produce inorganic silicon carbide/silicon nitride fibers. Allows possibility of creating improved silicon carbide/silicon nitride fibers, replacing graphite fibers in composite materials requiring high electrical resistance and thermal stability.

B89-10240**STUDY OF PHASE SEPARATION IN GLASS**

GEORGE F. NEILSON (Caltech), MICHAEL C. WEINBERG (Caltech), and GARY L. SMITH (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16796**Vol. 13, No. 5, P. 65**

Report describes an experimental study of effect of hydroxide content on phase separation in soda/silica glasses. Ordinary and gel glasses melted at 1,565 degree C, and melts stirred periodically. 'Wet' glasses produced by passing bubbles of N₂ saturated with water through melts; 'dry' glasses prepared in similar manner, except N₂ dried before passage through melts. Analyses of compositions of glasses performed by atomic-absorption and

index-of-refraction measurements. Authors conclude hydroxide speeds up phase separation, regardless of method (gel or ordinary) by which glass prepared. Eventually helps material scientists to find ways to control morphology of phase separation.

B89-10241**EFFECTS OF TWIST ON CERAMIC THREADS**

PAUL M. SAWKO, and HUY KIM TRAN (San Jose State Univ.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11849**Vol. 13, No. 5, P. 66**

Report describes study of effects of yarn twist and other manufacturing parameters on strength of ceramic sewing threads. Three types of thread considered; silica, aluminoborosilicate (ABS) with 14 percent boria, and ABS with 2 percent boria. For silica thread, best twist found 300 turns per meter. Produced highest break strength at temperatures up to about 540 degree C. Overall strengths of both ABS threads higher than silica thread. Threads used to stitch insulating blankets for reusable spacecraft; must resist high temperatures and high aerodynamic loads of reentry into atmosphere of Earth.

B89-10297**GLASS COATS FOR HOT ISOSTATIC PRESSING**

GUNES M. ECER (Rockwell International Corp.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29501**Vol. 13, No. 6, P. 64**

Surface voids sealed from pressurizing gas. Coating technique enables healing of surface defects by hot isostatic pressing (HIP). Internal pores readily closed by HIP, but surface voids like cracks and pores in contact with pressurizing gas not healed. Applied to casting or weldment as thick slurry of two glass powders: one melts at temperature slightly lower than used for HIP, and another melts at higher temperature. For example, powder is glass of 75 percent SiO₂ and 25 percent Na₂O, while other powder SiO₂. Liquid component of slurry fugitive organic binder; for example, mixture of cellulose acetate and acetone. Easy to apply, separates voids from surrounding gas, would not react with metal part under treatment, and easy to remove after pressing.

B89-10298**RESISTANCE TO DELAMINATION IN COMPOSITE MATERIALS**

T. KEVIN OBRIEN

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13753**Vol. 13, No. 6, P. 66**

Fracture-mechanics approach applied to delamination failures. Report presents fracture-mechanics approach to analyzing, characterizing, and designing against delamination. In study, examples of delamination problems illustrated wherein strain-energy-release rate associated with growth of delamination useful generic parameter, independent of thickness, layup, and source of delamination, for characterization of failure by delamination. Several techniques for calculation of strain-energy-release rates for delaminations from variety of sources outlined. Technique for quantification of durability due to cyclic loading presented.

B89-10299**UNIFIED SYSTEM OF DATA ON MATERIALS AND PROCESSES**

CARLO F. KEY (EER Systems)

Jun. 1989 Additional information available through: NASA STI

04 MATERIALS

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27212 Vol. 13, No. 6, P. 66

Wide-ranging sets of data for aerospace industry described. Document describes Materials and Processes Technical Information System (MAPTIS), computerized set of integrated data bases for use by NASA and aerospace industry. Stores information in standard format for fast retrieval in searches and surveys of data. Helps engineers select materials and verify their properties. Promotes standardized nomenclature as well as standardized tests and presentation of data. Format of document of photographic projection slides used in lectures. Presents examples of reports from various data bases.

B89-10300 **EFFECT OF SOLIDIFICATION SPEED ON FATIGUE PROPERTIES**

M. H. MCCAY, D. D. SCHMIDT, W. D. HAMILTON, W. S. ALTER, and R. A. PARR

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27215 Vol. 13, No. 6, P. 67

Fast solidification increases fatigue life, but failure distribution becomes less predictable. Report describes effects of rate of solidification on nickel-based super-alloy MAR-M246(Hf) used in turbine blades. Based on experiments in which specimens directionally solidified at 5 cm/h and 30 cm/h, then tested for high cycle fatigue. Specimens also inspected by energy-dispersive x-ray (EDX) analysis and optical and electron microscopy.

B89-10362 **PMR RESIN COMPOSITIONS FOR HIGH TEMPERATURES**

RAYMOND D. VANNUCCI

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16071)

LEW-14658 Vol. 13, No. 7, P. 56

Report describes experiments to identify polymer matrix resins suitable for making graphite-fiber laminates used at 700 degree F (371 degree C) in such applications as aircraft engines to achieve higher thrust-to-weight ratios. Two particular high-molecular-weight formulations of PMR (polymerization of monomer reactants) resins most promising. PMR compositions of higher FMW exhibit enhanced thermo-oxidative stability. Formation of high-quality laminates with these compositions requires use of curing pressures higher than those suitable for compositions of lower FMW.

B89-10363 **ELECTROCHEMICAL STUDIES OF ALUMINUM COATED WITH PRIMER**

MERLIN D. DANFORD, and WARD W. KNOCKEMUS (Huntington College)

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-21076)

MFS-27184 Vol. 13, No. 7, P. 56

Technical paper describes experiments using ac-impedance method of analyzing corrosion of metal surfaces and breakdown of protective coatings. Alternating-current-impedance scans provide more detailed information, indicating changes in corrosion rates, progressive deterioration of coatings, changes in metal surfaces, and reaction mechanisms. Changes in conditions of coatings detected by ac method before dc methods show increase in metal-corrosion current. Measurements of impedance as function of frequency provides sufficient data to enable resistances and capacitances to be determined by performing least-squares fit. Knowledge of dependence of these values on time leads to more detailed understanding of corrosion process.

B89-10364

RAPID ANNEALING OF AMORPHOUS HYDROGENATED CARBON

SAMUEL A. ALTEROVITZ, JOHN J. POUCH, and JOSEPH D. WARNER

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20821)

LEW-14664 Vol. 13, No. 7, P. 58

Report describes experiments to determine effects of rapid annealing on films of amorphous hydrogenated carbon. Study represents first efforts to provide information for applications of a-C:H films where rapid thermal processing required. Major finding, annealing causes abrupt increase in absorption and concomitant decrease in optical band gap. Most of change occurs during first 20 s, continues during longer annealing times. Extend of change increases with annealing temperature. Researchers hypothesize abrupt initial change caused by loss of hydrogen, while gradual subsequent change due to polymerization of remaining carbon into crystallites or sheets of graphite. Optical band gaps of unannealed specimens on silicon substrates lower than those of specimens on quartz substrates.

B89-10365

MEASURING MECHANICAL PROPERTIES OF OPTICAL GLASSES

DENNIS S. TUCKER (University of Alabama), and RONALD L. NICHOLS (University of Alabama)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27206 Vol. 13, No. 7, P. 60

Report discusses mechanical tests measuring parameters of strength and fracture mechanics of optical glasses. To obtain required tables of mechanical properties of each glass of interest, both initial-strength and delayed-fracture techniques used. Modulus of rupture measured by well-known four-point bending method. Initial bending strength measured by lesser-known double-ring method, in which disk of glass supported on one face near edge by larger ring and pressed on its other face by smaller concentric ring. Method maximizes stress near center, making it more likely specimen fractures there, and thereby suppresses edge effects. Data from tests used to predict reliabilities and lifetimes of glass optical components of several proposed spaceborne instruments.

B89-10407

SILVER INK FOR JET PRINTING

R. W. VEST (Purdue Univ.), and SARASWATHI SINGARAM (Purdue Univ.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17153 Vol. 13, No. 8, P. 50

Metallo-organic ink containing silver (with some bismuth as adhesion agent) applied to printed-circuit boards and pyrolyzed in air to form electrically conductive patterns. Ink contains no particles of silver, does not have to be mixed during use to maintain homogeneity, and applied to boards by ink-jet printing heads. Consists of silver neodecanoate and bismuth 2-ethylhexanoate dissolved in xylene and/or toluene.

B89-10408

MAKING MgO/SiO₂ GLASSES BY THE SOL-GEL PROCESS

NAROTTAM P. BANSAL

Aug. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23750)

LEW-14714 Vol. 13, No. 8, P. 50

Silicon dioxide glasses containing 15 mole percent magnesium oxide prepared by sol-gel process. Not made by conventional melting because ingredients immiscible liquids. Synthesis of MgO/SiO₂ glass starts with mixing of magnesium nitrate

hexahydrate with silicon tetraethoxide, both in alcohol. Water added, and transparent gel forms. Subsequent processing converts gel into glass. Besides producing glasses of new composition at lower processing temperatures, sol-gel method leads to improved homogeneity and higher purity.

B89-10454

**ACCELERATED TESTING OF PHOTOTHERMAL
DEGRADATION OF POLYMERS**

SOON SAM KIM (Caltech), RANTY HING LIANG (Caltech), and FUN-DOW TSAY (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17454

Vol. 13, No. 9, P. 72

Electron-spin-resonance (ESR) spectroscopy and Arrhenius plots used to determine maximum safe temperature for accelerated testing of photothermal degradation of polymers. Aging accelerated by increasing illumination, temperature, or both. Results of aging tests at temperatures higher than those encountered in normal use valid as long as mechanism of degradation same throughout range of temperatures. Transition between different mechanisms at some temperature identified via transition between activation energies, manifesting itself as change in slope of Arrhenius plot at that temperature.

B89-10455

SURROGATE SEEDS FOR GROWTH OF CRYSTALS

PAUL J. SHLICHTA (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17339

Vol. 13, No. 9, P. 73

Larger crystals of higher quality grown. Alternative method for starting growth of crystal involves use of seed crystal of different material instead of same material as solution. Intended for growing single-crystal proteins for experiments but applicable in general to growth of crystals from solutions and to growth of semiconductor or other crystals from melts.

B89-10456

**THE ACEE PROGRAM AND BASIC RESEARCH ON
COMPOSITES**

MARVIN B. DOW

Sep. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-29612)

LAR-14028

Vol. 13, No. 9, P. 74

NASA reference publication describes research in composites conducted at Langley Research Center between 1975 and 1986. Includes Langley basic technology and composite-primary-structures element of NASA Aircraft Energy Efficiency (ACEE) Program. Basic technology documents cited in bibliography grouped according to research activity; for example, design and analysis, fatigue and fracture, and tolerance to damage. ACEE documents cover development of composite structures for transport aircraft. Report deals only with resin/matrix composite materials.

B89-10511

OZONE/ULTRAVIOLET-PHOTO-OXIDATION REACTOR

ARI BEN SWARTZ (Lockheed Engineering and Management Services Co., Inc.), and RICHARD E. AGTHE (Lockheed Engineering and Management Services Co., Inc.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21488

Vol. 13, No. 10, P. 50

Experimental chemical-processing system destroys waste

hydrazine in water by use of ozone in ultraviolet-photo-oxidation reactor. New process reduces concentrations of hydrazines and intermediate decomposition products in effluent liquid and gas to below limit of detectability. Liquid sprayed in reaction chamber past ultraviolet lamps, against flow of oxygen and ozone. Hydrazines and intermediate decomposition products oxidized to harmless substances. Effectiveness and speed of process depends on maintenance of circulating liquid at correct pH, determines lower limit of oxidation by ozone.

B89-10512

POURABLE FOAM INSULATION

JAMES A. HARVEY (Dayton Univ.), JOHN M. BUTLER (Dayton Univ.), and RICHARD P. CHARTOFF (Dayton Univ.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27217

Vol. 13, No. 10, P. 52

Report describes search for polyisocyanurate/polyurethane foam insulation with superior characteristics. Discusses chemistry of current formulations. Tests of formulations, of individual ingredients and of alternative new formulations described. Search revealed commercially available formulations exhibiting increased thermal stability at temperatures up to 600 degree C, pours readily before curing, presents good appearance after curing, and remains securely bonded to aluminum at cryogenic temperatures. Total of 42 different formulations investigated, 10 found to meet requirements.

B89-10558

CERAMIC WICK FOR CAPILLARY-PUMPED HEAT PIPE

BENJAMIN SEIDENBERG, and THEODORE SWANSON

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13199

Vol. 13, No. 11, P. 52

Fibrous ceramic wick allows choice of working fluid and high-temperature fabrication and/or operation. Wick material resists degradation at temperatures from -195 to +1,500 degrees C. Liquid refrigerant fills bore of silica/alumina wick. After flowing by capillary action through pores of wick, refrigerant evaporates from finned outer surface of wick and enters heat pipe, flowing toward condenser section.

B89-10559

MAKING A NOBLE-METAL-ON-METAL-OXIDE CATALYST

IRVIN M. MILLER, PATRICIA P. DAVIS, and BILLY T. UPCHURCH (Science and Technology Corp.)

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13741

Vol. 13, No. 11, P. 52

Catalyst exhibits superior performance in oxidation of CO in CO₂ lasers. Two-step process developed for preparing platinum- or palladium-on-tin-oxide catalyst for recombination of CO and O₂, decomposition products that occur in high-voltage discharge region of closed-cycle CO₂ laser. Process also applicable to other noble-metal/metal-oxide combinations.

B89-10606

LOW-DENSITY, SPRAYABLE, THERMAL INSULATION

JAMES P. MCLEMORE, WILLIAM E. NORTON, JOE D. LAMBERT, WILLIAM G. SIMPSON, SHERMAN ECHOLS, MAX H. SHARPE, and WILLIAM E. HILL

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28372

Vol. 13, No. 12, P. 44

Improved formulation prevents cracks. Low-density, thermally

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insulating material applied by spraying it onto surface to be protected. Material, called 'MSA-2' improved version of similar material called 'MSA-1'. Useful as sprayed, lightweight insulation to cover large areas in terrestrial applications in which manual attachment too slow or impractical. Formulated to be more flexible and to prevent coats as thick as 1/2 in. from developing stress cracks as they cure.

B89-10607

SIMPLE TEST FOR ORGANIC MATERIAL IN GAS

EDUARDO BARZANA (Massachusetts Inst. of Tech.), ALEXANDER KLIBANOV (Massachusetts Inst. of Tech.), and MARCUS KAREL (Massachusetts Inst. of Tech.)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17540

Vol. 13, No. 12, P. 45

Dried enzymes and color indicators test sensitively and selectively. Dehydrated enzymes used in convenient method for analyzing gases for specific organic substances, outside laboratory. Method used to detect alcohol in breath or formaldehyde in gas streams. Used for simple semiquantitative detection or for precise quantitative measurement.

B89-10608

PHOTOCHEMISTRY OF 2,5-DIACYL-1, 4-DIMETHYLBENZENES

MICHAEL A. MEADOR

Dec. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-22005), '2-5-Diacetyl-1, 4-Dimethylbenzenes - Examples Of Bisphotoenol Equivalents'

LEW-14708

Vol. 13, No. 12, P. 46

Experiments described in report revealed potentially useful aspects of photochemistry of 2,5-dibenzoyl-1, 4-dimethylbenzene (DBX) and 2,5-diacetyl-1, 4-dimethylbenzene (DAX). Behavior of these compounds reminiscent of orthoalkylphenyl ketones, studied from similar perspective for more than two decades.

B90-10015

ISOMERIC TRISARYLOXYCYCLOTRIPHOSPHAZENE POLYMER PRECURSORS

TERRY L. ST. CLAIR, and DEVENDRA KUMAR

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13819

Vol. 14, No. 1, P. 42

Substances useful for making heat-and fire-resistant polymers. Cyclotriphosphazene-based monomers and polymer precursors led to development of high-temperature materials. Cyclotriphosphazene-derived monomers, polymer precursors, and polymers becoming important from both industrial and scientific points of view. Presence of phosphazene moiety in cyclotriphosphazene-based monomers and polymer precursors expected to impact special properties in desired high-performance materials containing inorganic backbones for aerospace applications. Useful for obtaining heat-and fire-resistant polymers for composites, adhesives, molding powders, and coating laminates. Also used in structures (e.g. secondary structures in aircraft), in construction of spacecraft, and in electronics and computer industries.

B90-10016

SURVEY OF INFRARED-ABSORBING COATINGS

SHELDON M. SMITH, and RICHARD V. HOWITT (Teletac, Inc.)

Jan. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-28757)'Survey of Material for an Infrared-Opaque Coating'

ARC-11767

Vol. 14, No. 1, P. 42

Carbon black and silicon carbide grit low reflectance additives. Report presents results of survey of candidate materials for use as attenuators of stray radiation in far-infrared telescopes. More than 40 reflectance spectra at 17 degrees incidence, in wave-length range from 20 to 500 micrometer, obtained from variety of coatings, binders, and additives.

B90-10017

ELECTROCHEMICAL STUDY OF CORROSION OF PAINTED STEEL

M. H. MENDREK, R. H. HIGGINS, and M. D. DANFORD

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27213

Vol. 14, No. 1, P. 44

Resistor-and-capacitor circuit models represent evolving properties of coated specimens. Electrochemical experiments on corrosion of painted 4130 steel described in report. Study part of general development of ac-impedance method for measurement of properties of coated metals.

B90-10062

FINDING PLATINUM-COATING GAPS ON TITANIUM ANODES

RONNARD BODEMEIJER (Rockwell International Corp.), and CECIL E. FLOWERS (Rockwell International Corp.)

Feb. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29389

Vol. 14, No. 2, P. 46

Simple procedure makes gaps visible to eye. New gap-detection method consists of plating thin layer of non-silver-colored metal like copper or gold on anode. Contrast in color between plated metal and bare anode material makes gaps stand out. If anode passes inspection, copper or gold plate removable by reversal of test-plating current. Remains to be determined whether test plating and removal damages anode. New method simpler and more economical than previous attempts to identify gaps in platinum.

B90-10063

FILLING POROUS MICROSPHERES WITH MAGNETIC MATERIAL

MANCHUIM CHANG (Caltech), and MICHAEL S. COLVIN (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17044

Vol. 14, No. 2, P. 47

New process produces magnetic microspheres with controllable sizes, compositions, and properties for use in medical diagnostic tests, biological research, and chemical processes. Paramagnetic microspheres also made with process. Porous plastic microspheres prepared by polymerization of monomer in diluent by cross-linking agent. When diluent removed, it leaves tiny pores throughout polymerized spheres. Size and distribution of pores determined by amount and type of diluent and cross-linking agent.

B90-10104

LIGHTWEIGHT, THERMALLY CONDUCTIVE COMPOSITE MATERIAL

G. RICHARD SHARP, and TIMOTHY A. LOFTIN (DWA Composite Specialties, Inc.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14814

Vol. 14, No. 3, P. 66

Aluminum reinforced with carbon fibers superior to copper in some respects. Lightweight composite material has high thermal conductivity. Consists of aluminum matrix containing graphite fibers, all oriented in same direction. Available as sheets, tubes, and

bars. Thermal conductivity of composite along fibers rises above that of pure copper over substantial range of temperatures. Graphite/aluminum composite useful in variety of heat-transfer applications in which reduction of weight critical. Used to conduct heat in high-density, high-speed integrated-circuit packages for computers and in base plates for electronic equipment. Also used to carry heat away from leading edges of wings in high-speed airplanes.

B90-10105

YBA₂Cu₃O_x SUPERCONDUCTORS DOPED WITH AGO

PALMER N. PETERS, and MAW-KUEN WU

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26078

Vol. 14, No. 3, P. 66

Improved superconductive materials made by doping compressed powder destined to become YBa₂Cu₃O_x superconductors with AgO prior to heat treatment. Magnetic properties unlike those of any other superconductor. Specimen suspendable below as well as above magnets, and suspension stable as long as material remains superconductive.

B90-10106

TRIBOLOGICAL PROPERTIES OF CERAMICS

KAZUHISHA MIYOSHI

Mar. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-17801)'Adhesion, Friction, and Micromechanical Properties of Ceramics'

LEW-14833

Vol. 14, No. 3, P. 67

Report reviews adhesion, friction, and micromechanical properties of ceramics - properties increasingly important as more ceramic materials used in bearings, seals, and gears in advanced engines and in cutting tools and extrusion dies. Report considers effects of contaminating surface films, temperature, and chemical interactions. Examines ceramics, in both monolithic and coating form, in contact with themselves, with other harder materials, and with metals.

B90-10166

ADVANCED REUSABLE FOAM CRYOGENIC INSULATION

ALLAN H. TAYLOR, P. S. MCAULIFFE (Lockheed-California Co.), and L. L. SPARKS

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14014

Vol. 14, No. 4, P. 55

Lightweight, reusable cryogenic containers reduce costs of operation of advanced hypersonic airplanes and space launch vehicles. Specimens demonstrated in temperature range of negative 420 to positive 400 degrees F (negative 251 to positive 204 degrees C). Prototype reusable cryogenic foam insulation developed. Consists of two discrete layers of closed-cell polymethacrylimide foam of density 6.9 lb/ft to the 3rd power (111 kg/m to the 3rd power) bonded together with epoxy adhesive. Additionally reinforced with 0.003-in. (0.08-mm)-thick layer of fiberglass cloth. Wrapped with precut and preformed vapor-barrier cover. Such containers useful on Earth in laboratories, factories, and transportation systems.

B90-10167

PROTOTYPE V-GROOVE RADIATOR HEAT SHIELD

S. WALTER PETRICK (Caltech), and STEVEN BARD (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17744

Vol. 14, No. 4, P. 55

Report describes design, fabrication, and testing of heat radiator

equipped with multi-V-groove radiator heat shield. Device compact, efficient structure which removes heat from infrared detectors, gamma-ray detectors, and similar instruments aboard Mars Observer spacecraft and radiates heat into outer space. Designed to maintain detector for gamma-ray spectrometer at temperature of 80 K in cold vacuum under heat load of 80 mW. Prototype made of aluminum, though production shields made of aluminized sheets of polyethylene terephthalate.

B90-10168

HIGH-TEMPERATURE MATERIALS FOR STIRLING ENGINES

HAROLD E. SLINEY

Apr. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-15872)'Hot Piston Ring/Cylinder Liner Materials - Selection and Evaluation'

LEW-14836

Vol. 14, No. 4, P. 56

Heat-resistant piston rings and linings increase engine efficiency. Report discusses research on materials for piston rings and cylinder coatings in automotive Stirling engines. Data from tests show cobalt-based alloy, Stellite 6B, good choice for piston rings and PS200, plasma-sprayed metal-bonded chromium carbide matrix with dispersed solid lubricants, functions well as cylinder coating. Materials make it possible to place piston rings at tops of pistons ('hot' piston rings) instead of at cooler bottoms.

B90-10226

ETHYNYL-TERMINATED IMIDOTHIOETHERS AND DERIVED RESINS

PAUL M. HERGENROTHER, JOHN W. CONNELL, and R. G. BASS (Virginia Commonwealth Univ.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13910

Vol. 14, No. 5, P. 59

New toughened epoxies exhibit excellent properties, but temperatures at which used limited. Bismaleimide resins some of base materials being formulated to develop materials used at moderate temperatures. Work conducted on use of acetylenic (ethynyl) group to cross-link and extend chains of oligomers and polymers to obtain materials that perform at high temperatures. Work extended to ethynyl-terminated imidothioethers (ETI's). Tested primarily as adhesives and composite matrices and found to have useful properties in terms of processing, resistance to high temperature, fracture toughness, and resistance to solvents. Also have desirable mechanical properties. Potentially useful for aerospace and nonaerospace applications.

B90-10227

FLAMMABILITIES OF GRAPHITE-REINFORCED COMPOSITES

DEMETRIUS A. KOURTIDES

May 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-16825)'Review of Thermal Properties of Graphite Composite Materials'

ARC-12165

Vol. 14, No. 5, P. 60

Report describes tests and comparisons of flammabilities, thermal properties, and selected mechanical properties of composite materials made of epoxy and other matrices reinforced by graphite fibers. Composites also compared with baseline epoxy/fiberglass composite. Considers such properties as limiting oxygen index, smoke evolution, products of thermal degradation, total heat release, heat-release rate, loss of mass, spread of flames, resistance to ignition, and thermal stability.

B90-10228

PYROLYSIS PRODUCTS OF DIMETHYLDICHLOROSILANE

D. E. CAGLIOSTRO, S. R. RICCITIELLO, and M. G. CARSWELL (San Jose State Univ.)

May 1990 Additional information available through: NASA STI

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Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12169 Vol. 14, No. 5, P. 61

Report describes experimental study of chemical reactions and chemical products of chemical-vapor deposition of silicon carbide from dimethyldichlorosilane. Topic important because it relates to current interest in lightweight refractory materials for use in advanced aircraft and spacecraft. Analyses showed that at temperature of 700 to 1,100 degrees C and contact time of about 1 minute, SiC forms by two chemical-reaction paths.

B90-10283

TOUGH, MICROCRACKING-RESISTANT, HIGH-TEMPERATURE POLYMER

RUTH H. PATER, PERT RAZON, RICKY SMITH, DENNIS WORKING, ALICE CHANG (PRC), and MARGARET GERBER (PRC)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13925 Vol. 14, No. 6, P. 64

Simultaneous synthesis from thermosetting and thermoplastic components yields polyimide with outstanding properties. Involves process in which one polymer cross-linked in immediate presence of other, undergoing simultaneous linear chain extension. New material, LaRC-RP40 synthesized from high-temperature thermosetting imide prepolymer and from thermoplastic monomer. Three significantly improved properties: toughness, resistance to microcracking, and glass-transition temperature. Shows promise as high-temperature matrix resin for variety of components of aircraft engines and for use in other aerospace structures.

B90-10284

REINFORCING LINER FOR COMPOSITE CRYOGENIC TANK

JOHN E. BURGESSON (General Dynamics Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28399 Vol. 14, No. 6, P. 66

Proposed fiber-reinforced liner for graphite/epoxy fuel tank prevents metal-foil leakage barrier from detaching at low temperatures. Consists of epoxy containing fibers of Spectra 1000. Tank holds inner layers of foil, adhesive, and proposed liner. Liner much thinner than shell, adds little weight, and subtracts little volume. Lined composite tank used to hold liquids from room temperature to cryogenic temperatures. Not suitable for oxygen, because organic materials in liner oxidized quickly.

B90-10285

PREPARATION OF HIGH-TEMPERATURE REACTIVE OLIGOMERS

RAPHAEL M. OTTENBRITE (Virginia Commonwealth University)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13965 Vol. 14, No. 6, P. 66

Very reactive materials form very-heat-stable polymers. Recent research directed toward synthesis of polyimides soluble in common organic solvents, melt-processable, and thermally curable without evolution of volatile by-products. Diels-Alder polymerization yields compounds that maintain integrities and toughnesses during long exposure times at high temperatures. High-temperature polymers synthesized by use of technique. Films and perhaps fibers fabricated from prepolymer in solution. Major potential at this stage of research limited to aerospace applications.

B90-10286

FRICTION AND WEAR OF SILICON CERAMICS

DANIEL L. DEADMORE, and HAROLD E. SLINNEY

Jun. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-17796)

LEW-14835 Vol. 14, No. 6, P. 67

Report presents results of experimental study of friction and wear in unlubricated sliding of silicon-based ceramics on Inconel(R) 718 nickel-based alloy. Both monolithic and fiber-reinforced ceramics tested at temperatures from 25 to 800 degrees C. Evaluates ceramic materials for potential use as cylinder liners, piston caps, and other engine parts subjected to sliding or rubbing.

B90-10341

ENHANCEMENT OF PT/SNO2 CATALYSTS BY ADDITION OF H2O

DAVID R. SCHRYER, BARRY D. SIDNEY, JOHN D. VAN NORMAN (Old Dominion Research Foundation), KENNETH G. BROWN (Old Dominion Research Foundation), JACQUELINE SCHRYER (Old Dominion Research Foundation), and BILLY T. UPCHURCH (Science and Technology Corp.)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14084 Vol. 14, No. 7, P. 54

Water vapor in pretreatment gas restores essential hydroxyl groups. Platinum on tin oxide (Pt/SnO2) is good catalyst for oxidation of carbon monoxide (CO) at temperatures from about 25 degrees C to 100 degrees C. Activity of Pt/SnO2 for CO oxidation significantly enhanced by pretreating it at approximately 225 degrees C with reducing gas such as CO. Technique useful in manufacture of high-power CO2 lasers for industrial and scientific uses.

B90-10342

HIGH-TEMPERATURE POLYIMIDE RESIN

RAYMOND D. VANUCCI, and DIANE C. MALARIK

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14923 Vol. 14, No. 7, P. 54

Improved polyimide resin used at continuous temperatures up to 700 degrees F (371 degrees C). PMR-II-50, serves as matrix for fiber-reinforced composites. Material combines thermo-oxidative stability with autoclave processability. Used in such turbine engine components as air-bypass ducts, vanes, bearings, and nozzle flaps. Other potential applications include wing and fuselage skins on high-mach-number aircraft and automotive engine blocks and pistons.

B90-10343

LARC-I-TPI: A NEW THERMOPLASTIC POLYIMIDE

TERRY L. ST. CLAIR, DONALD J. PROGAR, and J. RICHARD PRATT (PRC, Inc.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14101 Vol. 14, No. 7, P. 55

'LARC-I-TPI' denotes improved version of LARC-TPI class of thermoplastic polyimides: high-performance polymers developed for manufacture of strong, lightweight aircraft structures. Melt-flow and adhesive properties of new polymers make them attractive for use as matrix resins for composites, molding powders, adhesives, and coating films. Less toxic, improved LARC-I-TPI polymers formulated without 3, 3'-diaminobenzophenone, which is mutagenic and commercially unavailable.

B90-10344

REDUCING RUN-IN WEAR OF CERAMIC-BASED COATINGS

CHRISTOPHER DELLACORTE, HAROLD E. SLINNEY, and DANIEL L. DEADMORE

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-15885)

LEW-14834 Vol. 14, No. 7, P. 56

Silver surface layer helps rough ceramic slide smoothly. Thin film is magnetron-sputtered onto PS200, self-lubricating composite coating containing mixture of chromium carbide, silver, and barium fluoride/calcium fluoride eutectic. Carbide provides wear resistance, while silver and fluorides provide lubrication. Because both silver top coat and PS200 thermally and chemically stable oxidizing and reducing environments to 900 degrees C, combination appropriate as lubrication for cylinder-wall/piston-ring contacts in Stirling engines and for backup lubrication for gas lubricated journal bearings.

B90-10345

POLYMERIC ADDITIVES FOR GRAPHITE/EPOXY COMPOSITES

D. A. KOURTIDES, and Z. NIR (Makhteshim Chemical Works)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11427 Vol. 14, No. 7, P. 56

Report describes experimental studies of properties of several graphite/epoxy composites containing polymeric additives as flexibilizing or toughening agents. Emphasizes effects of brominated polymeric additives (BPA's) with or without carboxy-terminated butadiene acrylonitrile rubber. Reviews effects of individual and combined additives on fracture toughnesses, environmental stabilities, hot/wet strengths, thermomechanical behaviors, and other mechanical properties of composites.

B90-10346

FIBER-REINFORCED SUPERALLOYS FOR ROCKET ENGINES

JACK R. LEWIS (Rockwell International Corp.), JIM L. YUEN (Rockwell International Corp.), DONALD W. PETRASEK, and JOSEPH R. STEPHENS

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-15990)'Fiber Reinforced Superalloys For Rocket Engines'

LEW-14871 Vol. 14, No. 7, P. 58

Report discusses experimental studies of fiber-reinforced superalloy (FRS) composite materials for use in turbine blades in rocket engines. Intended to withstand extreme conditions of high temperature, thermal shock, atmospheres containing hydrogen, high cycle fatigue loading, and thermal fatigue, which tax capabilities of even most-advanced current blade material - directionally-solidified, hafnium-modified MAR M-246 MAR M-246 (Hf) (DS). FRS composites attractive combination of properties for use in turbopump blades of advanced rocket engines at temperatures from 870 to 1,100 degrees C.

B90-10347

HIGH-TEMPERATURE CREEP BEHAVIOR OF FIBER-REINFORCED NIOBIUM

DONALD W. PETRASEK, and ROBERT H. TITRAN

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-18707)'Creep Behavior Of Tungsten/Niobium And Tungsten/Niobium-1 Percent Zirconium Composites'

LEW-14831 Vol. 14, No. 7, P. 58

Study conducted to determine feasibility of using composite materials in advanced space power systems, described in 22-page report. Tungsten fibers reduce creep and mass in advanced power systems. Reinforcing niobium alloys with tungsten fibers increases their resistances to creep by factors of as much as 10.

B90-10348

STABILITY OF A CARBON-DIOXIDE-REMOVING RESIN

THEODORE WYDEVEN, and PETER WOOD (San Jose State Univ.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12129 Vol. 14, No. 7, P. 59

Report describes experiments determining long-term chemical stability of IRA-45, commercial ion-exchange resin candidate for use in removing CO2 from atmosphere of Space Station. In proposed system, cabin air passes through resin, and acidic CO2 absorbed by weakly-basic hydrated diethylenetriamine bonded to porous resin substrate. When resin absorbs all CO2, disconnects from airstream and heated with steam to desorb CO2. Resin reusable. Removed by post-treating process air with phosphoric acid on charcoal. Other chemicals removed by trace-contaminant-control subsystem of Space Station.

B90-10405

LOW-NOISE, LONG-LIFE, HIGH-GAIN MICROCHANNEL-PLATE GLASS

W. BRUCE FELLER (Galileo Electro-Optics Corp.), and LEE M. COOK (Galileo Electro-Optics Corp.)

Aug. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14010 Vol. 14, No. 8, P. 47

Dark noise reduced substantially without degrading other properties. Glass suitable for use as active material for microchannel plates (MCP's) free of constituents including significant amounts of radioactive isotopes.

B90-10406

REWATERPROOFING CHEMICAL FOR USE WITH SILICONES

WILLIAM L. HILL (Rockwell International Corp.), SHIRLEY M. MITCHELL (Rockwell International Corp.), and HOWARD S. MASSEY (Rockwell International Corp.)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21569 Vol. 14, No. 8, P. 47

Agent restores impermeability without degrading silicone adhesives and substructures. Dimethylethoxysilane (DMES) found to rewaterproof tiles and composite panels internally without harming materials that underlie them. Replaces hexamethyldisilazane (HMDS) as postmission rewaterproofing agent for tiles of thermal-protection system on Space Shuttle. Much of original waterproofing lost during rigors of launch and reentry. Potential terrestrial application includes composite materials in such structures as bridges and submarines.

B90-10407

POLYIMIDAZOLES VIA AROMATIC NUCLEOPHILIC DISPLACEMENT

JOHN W. CONNELL, and PAUL M. HERGENROTHER

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14145 Vol. 14, No. 8, P. 48

Experiments show variety of polyimidazoles prepared by aromatic nucleophilic displacement, from reactions of bisphenol imidazoles with activated difluoro compounds. Polyimidazoles have good mechanical properties making them suitable for use as films, moldings, and adhesives.

B90-10408

ADDITIVES LOWER DIELECTRIC CONSTANTS OF POLYIMIDES

DIANE M. STOKELY, ANNE K. ST. CLAIR, BURT R. EMERSON, JR., and KENNETH M. PROCTOR

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Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13902 Vol. 14, No. 8, P. 49

Dielectric constants as low as 2.43 make polyimides more attractive for electronic applications. Process makes aromatic condensation polyimide films and coatings with dielectric constants lowered by incorporation of diamine acid additives. Materials provide better electrical insulation without sacrificing temperature stability of polyimide binders. Applicable whenever high temperature, low absorption of moisture, and high electrical-insulation properties needed. Applications include semiconductors and printed-circuit boards for computer industry and possibly automotive industry.

B90-10461

MAKING SELF-LUBRICATING PARTS BY POWDER METALLURGY

HAROLD E. SLINEY, and CHRISTOPHER DELLACORTE

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14902 Vol. 14, No. 9, P. 63

Compositions and parameters of powder-metallurgical fabrication processes determined for new class of low-friction, low-wear, self-lubricating materials. Used in oxidizing or reducing atmospheres in bearings and seals, at temperatures from below 25 degrees C to as high as 900 degrees C. Thick parts made with minimal waste.

B90-10462

MILDER ETCHANT FOR PENETRANT INSPECTION

JOSEPH E. O'TOUSA (Rockwell International Corp.), and CLARK S. THOMAS (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29645 Vol. 14, No. 9, P. 63

New etching solution for chemical penetrant inspection of Inconel(R) 718 castings and weldments. Etchant does not introduce artifacts mistaken for defects. Applied by swabbing or by immersion. Used to detect unwanted residues of Niore(R) (or equivalent) gold brazing alloy on type 347 stainless steel.

B90-10463

PROCESS FOR AUTOCLAVING HMW PMR-II COMPOSITES

RAYMOND D. VANNUCCI, and DIANE CIFANI

Sep. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-24712)*700 Degrees F Properties Of Autoclave Cured PMR-II Composites.

LEW-14839 Vol. 14, No. 9, P. 64

Parts made of graphite-reinforced, high-molecular-weight (HMW) PMR-II polyimide easy to fabricate by autoclaving. Study showed autoclaved HMW PMR-II parts equal in quality to those made by compression molding. Well suited to use at temperatures up to 700 degrees F (371 degrees C). In aircraft engines, they offer advantages of strength and light weight.

B90-10532

DELAMINATION ANALYSIS OF COMPOSITE CURVED BARS

WILLIAM L. KO, and RAYMOND H. JACKSON

Oct. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N90-12669)

ARC-12347 Vol. 14, No. 10, P. 71

Classical anisotropic elasticity theory used to construct 'multilayer' composite semicircular curved bar subjected to end forces and end moments. Radial location and intensity of open-mode delamination stress calculated and compared with results obtained from anisotropic continuum theory and from finite element method. Multilayer theory gave more accurate predictions

of location and intensity of open-mode delamination stress. Currently being applied to predict open-mode delamination stress concentrations in horse-shoe-shaped composite test coupons.

B90-10533

CALCULATING THE RESISTIVITY OF A DEPOSITED FILM

LAWRENCE G. OBERLE, and GUSTAVE C. FRALICK

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14389 Vol. 14, No. 10, P. 72

Iterative procedure computes resistivity from measurements by four-probe method. Computer program and technique developed to aid in solution of class of problems in which measurements of electrical resistivity needed for substance deposited on substrate of higher resistivity than deposited layer.

B90-10534

FINITE-ELEMENT COMPOSITE-ANALYSIS PROGRAM

DAVID E. BOWLES

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14109 Vol. 14, No. 10, P. 73

Finite Element Composite Analysis Program, FECAP, special-purpose finite-element program for analyzing behavior of composite material with microcomputer. Procedure leads to set of linear simultaneous equations relating unknown nodal displacement to applied loads. Written in HP BASIC 3.0.

B90-10535

CALCULATING MASSES, DENSITIES, AND COMPOSITIONS OF ALLOYS

H. DE GROH

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14914 Vol. 14, No. 10, P. 73

Metallurgical Programs include three simple programs calculating solutions to problems common to metallurgical engineers and persons making metal castings. First program calculates mass of binary ideal mixture (alloy). Second, calculates densities of binary ideal mixture. Third, converts atomic percentages of binary mixture to weight percentages. Uses simple equations to assist with routine calculations. Written in Microsoft QuickBASIC.

B90-10586

NBSE3 CATHODES FOR LI RECHARGEABLE CELLS

RATNAKUMAR V. BUGGA (Caltech), CHING-ION NI (Caltech), SALVADOR DISTEFANO (Caltech), ROBERT B. SOMOANO (Caltech), and C. PERRY BANKSTON (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17491 Vol. 14, No. 11, P. 61

Report describes experimental studies involving preparation, characterization, and measurements of performance of NbSe3, intended for use as cathode material in lithium rechargeable electrochemical cells. Characteristics superior to those of other intercalating cathode materials, including high volumetric and gravimetric energy densities and ability to sustain discharges at high rates.

B90-10587

MICROSTRUCTURE OF A SIC/(TI/V/CR/SN/AL) COMPOSITE

BRADLEY A. LERCH, DAVID R. HULL, and TODD A. LEONHARDT (Sverdrup Technology, Inc.)

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N88-28095) 'As-Received Microstructure Of A SiC/Ti-15-3 Composite.'

LEW-14868 Vol. 14, No. 11, P. 61

NASA technical memorandum reports on analysis of composite material made of SiC fibers in matrix of 0.76 Ti/0.15 V/0.03 Cr/0.03 Sn/0.03 Al (parts by weight) alloy. Purposes of study to investigate suitability of some metallographic techniques for use on composite materials in general and to obtain information about macrostructure and microstructure of this specific composite to provide guidance for experimental and theoretical studies of more advanced composites.

B90-10588

POLYTETRAFLUOROETHYLENE-IMPREGNATED ANODIZATION FOR ALUMINUM

MERLIN D. DANFORD

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N89-26079) 'The Corrosion Protection Of Aluminum By Various Anodizing Treatments.'

MFS-27229

Vol. 14, No. 11, P. 63

Technical memorandum describes experiments on ability of two commercial coatings and of standard hard anodization to protect aluminum against corrosion. Both commercial coatings, Polyube and Tufam, polytetrafluoroethylene-impregnated anodizations. Standard hard-anodized coating found to provide greatest protection.

B90-10631

SINTERED FIBER ELECTRODES

JAMES E. SCHROEDER (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17213

Vol. 14, No. 12, P. 32

Method proposed to make improved porous electrodes for oxygen pumps, oxygen sensors, high-temperature solid-electrolyte fuel cells, and high-temperature solid-electrolyte electrolysis cells. Electrode made by sintering mat of conducting fibers. Many sintered bonds between intersecting fibers increase electrical conductivity and provide strength, yet allow mat to remain highly porous.

B90-10632

TAZ-8A ALLOY INCREASES THE THERMAL ENDURANCE OF STEEL

WILLIAM J. WATERS

Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14280

Vol. 14, No. 12, P. 32

TAZ-8A exhibits high strength at temperatures as high as 1,400 degrees F (760 degrees C) and resistance to oxidation; also exhibits excellent cyclic shock resistance between 600 and 2,000 degrees F (316 and 1,093 degrees C) and superplasticity at 1,800 degrees F (982 degrees C). Converts into fine powder and then flame-, plasma-, arc-, or wire-sprayed onto inexpensive steel substrate. Surface treatment with this alloy prolongs service life and reduces costs.

B90-10633

HEAT- AND OXIDATION-RESISTANT ELECTRODES

JAMES E. SCHROEDER (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17156

Vol. 14, No. 12, P. 34

Alloys coated with electrically conductive ceramics used to make

strong, oxidation-resistant electrodes for electrochemical cells operating at temperatures of 1,000 to 1,300 degrees C. Fe₃Al or Ni₃Al coated with strontium-doped lanthanum manganite more resistant to chemical attack than all-metal electrode, less brittle than all-ceramic electrode, and less costly than either alternative.

B90-10634

CHEAPER HYDRIDE-FORMING CATHODES

JACK A. JONES (Caltech), and GARY BLUE (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17927

Vol. 14, No. 12, P. 34

Hydride-forming cathodes for electrochemical experiments made of materials or combinations of materials cheaper and more abundant than pure palladium, according to proposal. Concept prompted by needs of experimenters in now-discredited concept of electrochemical nuclear fusion, cathodes useful in other electrochemical applications involving generation or storage of hydrogen, deuterium, or tritium.

B90-10635

POLYIMIDES CONTAINING CARBONYL AND ETHER CONNECTING GROUPS

PAUL M. HERGENROTHER, and STEPHEN J. HAVENS (Planning Research Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14001

Vol. 14, No. 12, P. 35

Polyimides of new class made from chemical reactions of aromatic dianhydrides with novel aromatic diamines in which carbonyl and ether groups connect aromatic rings. New polyimides melt-processable, strong, resistant to impacts, and resistant to solvents and other chemicals. Useful as adhesives, coatings, films, membranes, and composite matrices.

B90-10636

OPTICAL PROPERTIES OF CERAMIC FABRICS

M. A. COVINGTON, and P. M. SAWKO

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11739

Vol. 14, No. 12, P. 36

Report discusses optical properties of ceramic fabrics woven from silica, aluminoborosilicate, and silicon carbide yarns. Directional hemispheric reflectance and transmittance data given for several different weave patterns, yarn constructions, and fabric weights.

B90-10637

NEW MATERIALS AND TREATMENTS FOR TURBOPUMP BEARINGS

L. D. WEDEVEN (Wedeven Associates, Inc.), and N. C. MILLER (Wedeven Associates, Inc.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27238

Vol. 14, No. 12, P. 36

Report evaluates materials and surface treatments for bearings for liquid-oxygen turbopumps. Key properties sought for application are low friction, low wear, and resistance to corrosion and rolling-contact fatigue.

B90-10638

MECHANICAL PROPERTIES OF SiC/Si₃N₄ LAMINATES

R. T. BHATT (Army Aviation Research and Technology Activity),

04 MATERIALS

and R. E. PHILIPS (Sverdrup Technology, Inc.)
Dec. 1990 Additional information available through: NTIS,
Springfield, VA 22161 (Tel:703-487-4650) (N89-10952) and
(N89-10134)

LEW-14896 Vol. 14, No. 12, P. 37

Two reports describe tests to determine mechanical properties of laminates made of reaction-bonded silicon nitride matrices reinforced with 30 volume percent of aligned silicon carbide fibers. Emphasizes different aspects of topic. One focuses on behavior related to strength at ambient temperature; other focuses on strength after exposure to high temperatures. Overall, results indicate that composites are candidates for use at high temperatures; for example, as components of heat engines.

B90-10647

AN ENGINEER'S TOOL FOR PREDICTION OF AIRFRAME INTEGRATED SCRAMJET PERFORMANCE (SCRAM)

J. T. WALTON

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12338 Vol. 14, No. 12, P. 44

Program developed to support research on National Aero-Space Plane, which takes off horizontally and flies into orbit. SCRAM performs nose-to-tail simulation of real gas flow with equilibrium thermodynamic characteristics encountered in hydrogen-fueled ramjet/scramjet engine. Written for supersonic flows, code modified to handle subsonic flows and dual-mode combustor operation. Written in FORTRAN 77.

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B86-10043

SELF-CONTAINED NEUTRAL-BUOYANCY SUIT

B. E. BOSWELL (McDonnell Douglas Corp.), B. J. WALLACE (McDonnell Douglas Corp.), and T. G. WOODS (McDonnell Douglas Corp.)

Jun. 1986

MSC-20424 Vol. 10, No. 1, P. 90

Report discusses self-contained diving suit used in simulations of zero-gravity maneuvers in space suit. Method, called neutral-buoyancy immersion, useful in preparing astronauts for extravehicular activity.

B86-10195

VISUAL-ACCOMMODATION TRAINER/TESTER

ROBERT J. RANDLE, JR.

Jun. 1986

ARC-11426 Vol. 10, No. 2, P. 148

Ophthalmic instrument tests and helps develop focusing ability. Movable stage on a fixed base permits adjustment of effective target position as perceived by subject. Various apertures used to perform tests and training procedures. Ophthalmic instrument provides four functions: it measures visual near and far points; provides focus stimulus in vision research; measures visual-accommodation resting position; can be used to train for volitional control of person's focus response.

B86-10196

SPRING SMALL GRAINS AREA ESTIMATION

W. F. PALMER (Lockheed Engineering & Management Services Co., Inc.), and R. J. MOHLER (Lockheed Engineering & Management Services Co., Inc.)

Jun. 1986

MSC-20973 Vol. 10, No. 2, P. 149

SSG3 automatically estimates acreage of spring small grains from Landsat data. Report describes development and testing of a computerized technique for using Landsat multispectral scanner (MSS) data to estimate acreage of spring small grains (wheat, barley, and oats). Application of technique to analysis of four years of data from United States and Canada yielded estimates of accuracy comparable to those obtained through procedures that rely on trained analysis.

B86-10307

SMALL-PORTION WATER DISPENSER

J. C. JOERNS (Technology, Inc.)

May 1986

MSC-20534 Vol. 10, No. 3, P. 152

Pressure regulated and flow timed to control amount dispensed. Dispenser provides measured amount of water for reconstituting dehydrated foods and beverages. Dispenser holds food or beverage package while being filled with either cold or room-temperature water. Other uses might include dispensing of fluids or medicine. Pressure regulator in dispenser reduces varying pressure of water supply to constant pressure. Electronic timer stops flow after predetermined length of time. Timed flow at regulated pressure ensures controlled volume of water dispensed.

B86-10308

ROTATING APPARATUS FOR ISOELECTRIC FOCUSING

M. BIER (University of Arizona)

May 1986

MFS-26012 Vol. 10, No. 3, P. 152

Remixing of separated fractions prevented. Improved isoelectric focusing apparatus helps to prevent electro-osmosis and convection, both of which cause remixing of separated fractions. Fractionating column segmented and rotated about horizontal axis: Only combined effects of both features fully effective in making good separations. Improved apparatus slowly rotated continuously or rocked (at rotational amplitude of at least 180 degrees) about its horizontal axis so average gravitational vector experienced by fluid is zero and convection is therefore suppressed. Electro-osmosis suppressed and convection further suppressed by separating column into disklike compartments along its length with filters. Experiments have shown dimensions of apparatus not critical. Typical compartment and column volumes are 2 and 40 ml, respectively. Rotation speeds lie between 3 and 30 rpm.

B86-10408

FILTER BED OF PACKED SPHERES

D. D. ELLEMAN (Caltech), and T. G. WANG (Caltech)

Jul. 1986

NPO-15906 Vol. 10, No. 4, P. 140

Spheres sized and treated for desired sieve properties. Filter constructed from densely packed spheres restrained by screens. Hollow gas-filled plastic or metal spheres normally used. Manufactured within one percent or better diameter tolerance. Normally, all spheres in filter of same nominal diameter. Filter used as sieve to pass only particles smaller than given size or to retain particles larger than that size. Options available under filter concept make it easy to design for specific applications.

B86-10409

CONTRAST-SENSITIVITY RESEARCH

T. A. LAWTON (Caltech)

Jul. 1986

NPO-16643**Vol. 10, No. 4, P. 141**

Report presents study of visual effects of frequencies of luminance patterns and particularly how frequency components affect visibility of spatial phase differences over several octaves. Of interest to researchers engaged in development of algorithms relating to visual processing in robots, incorporation of human factors in design of visual displays, and development of set of rules visual system uses to reconstruct three-dimensional perception from two-dimensional neural representation.

B86-10480

ESTIMATING CROP YIELDS FROM MULTISPECTRAL REFLECTANCE

C. DAUGHTRY (Purdue University)

Sep. 1986

MSC-21060**Vol. 10, No. 5, P. 126**

Three reports describe research on proposed method for estimating crop yields by combining meteorological data with satellite measurements of reflected radiation to estimate crop-absorbed radiation. Concept, when tested over large areas, forms basis for evaluating crop conditions and estimating yields over regions where ground observations too costly or too difficult.

B86-10526

PHOTOELECTRONIC MONITOR OF MOTION SICKNESS

C. M. OMAN (Massachusetts Institute of Technology), and W. J. COOK (Massachusetts Institute of Technology)

Nov. 1986

MSC-20794**Vol. 10, No. 6, P. 94**

Instrument includes gallium arsenide light-emitting diode (LED) and silicon phototransistor with infrared filter, all cast in single plastic housing. Housing attached to subject's face with transparent double-sided adhesive tape. LED directs pulses of infrared light to skin, which reflects them to phototransistor. Phototransistor produces signal that is processed by external circuits to yield plot of infrared reflectance with time. External circuits temperature-compensated and respond only to pulsed component of detector output, rejecting those components caused by stray light. Circuits also extract blood-volume pulse amplitude and heart rate.

B86-10527

COLLECTION OF HUMAN WASTES ON LONG MISSIONS

D. C. JENNINGS (United Technologies Corp.), T. A. LEWIS (United Technologies Corp.), and H. F. BROSE (United Technologies Corp.)

Nov. 1986 See Also N85-17552/NSP

MSC-20968**Vol. 10, No. 6, P. 95**

Report evaluates and compares three alternative approaches to hygienic containment of human wastes. Three practical means of waste collection: filter-bag collection with compaction by fan suction, canister collection with compaction by force applied to compaction cups or disks, and sleeve collection with compaction by rollers and winding on reel. Potentially useful in airplanes, buses, boats, trains, and campers and temporary toilets for construction sites and outdoor gatherings.

B87-10051

CUTTING HEAD FOR ULTRASONIC LITHOTRIPSY

E. D. ANGULO, and R. GOODFRIEND (F.A.C.S.)

Jan. 1987

GSC-12944**Vol. 11, No. 1, P. 78**

Kidney stones lodged in urinary tract disintegrated with increased safety and efficiency by cutting head attached to end of vibrated wire probe. Aligns probe with stone and enables probe to vibrate long enough to disintegrate stone. Design of cutting head reduces risk of metal-fatigue-induced breakage of probe tip

leaving metal fragments in urinary tract. Teeth of cutting head both seat and fragment kidney stone, while extension of collar into catheter lessens mechanical strain in probe wire, increasing probe life and lessening danger of in situ probe breakage.

B87-10052

TRANSFORMATION AIDS CROP ANALYSIS FROM SPECTRAL DATA

E. P. CRIST (Environmental Research Institute of Michigan), and R. C. CICONE (Environmental Research Institute of Michigan)

Jan. 1987

MSC-20859**Vol. 11, No. 1, P. 79**

Crop analysis aided by mathematical transformation that optimizes perspective of six-dimensional, six-band, spectral data taken from spacecraft or aircraft. Transformation applied to any temperature/climate vegetated scene, providing direct view of regions of data concentration resulting from band correlations and fundamental reflectance properties of scene classes. Almost all of data variability captured in three spectral features, thus reducing by factor of 2 number of spectral features carried, incurring minimal loss of important information. Three-dimensional representation with two principal planes retains about 95 percent of six-dimensional spectral data used to distinguish among scenes containing green plants and bare soil with varying degrees of moisture.

B87-10104

MEASUREMENT OF HUMAN BLOOD AND PLASMA VOLUMES

J. E. GREENLEAF, and H. G. H. SZALKAY

Feb. 1987

ARC-11686**Vol. 11, No. 2, P. 80**

Report reviews techniques for measuring blood-plasma volume in humans. Common technique of using radioactive iodine isotope to label plasma albumin involves unwarranted risks from low-level radiation. Report emphasizes techniques using Evans-blue-dye (T-1824) labeling of albumin, hematocrit or hemoglobin/hematocrit measurements, or blood densitometry. In Evans-blue-dye technique, plasma volume determined from decrease in dye concentration occurring after small amount of dye solution injected into circulatory system. Subjection of Evans blue dye to test for carcinogenicity gave negative results.

B87-10158

INCREASING MAINTAINABILITY OF A WASTEWATER-RECOVERY UNIT

G. F. DEHNER (United Technologies Corp.), and H. F. BROSE (United Technologies Corp.)

Mar. 1987 See Also N85-16468/NSP

MSC-20984**Vol. 11, No. 3, P. 78**

Modified system leaks less and easier to disassemble for maintenance. Redesign of wastewater-recovery system separates water from urine: improved operation and system easier to maintain. Details of redesign, chiefly affected hollow-fiber-membrane evaporator, described in report.

B87-10211

HAND-STRENGTH METER

PING TCHENG, and JOE ELLIOT (U.S. Army Serostructures Directorate)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13507**Vol. 11, No. 4, P. 80**

Special grip-strength meter designed for accurate, reproducible measurement of hand rehabilitation. Four strain gauges connected in Wheatstone bridge to measure deflection caused by gripping hand. Compressive force exerted by hand transmitted to measuring beams. Beams therefore deflected or strained, and mechanical strain sensed by strain gauges and converted into electrical signal.

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After amplification and conditioning, signal displayed on LED as measure of gripping strength of hand.

B87-10258

SYSTEM FOR ODORLESS DISPOSAL OF HUMAN WASTE

DAVE JENNINGS (United Technologies Corp.), and TOD LEWIS (United Technologies Corp.)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28193

Vol. 11, No. 5, P. 80

Conceptual system provides clean, hygienic storage. Disposal system stores human wastes compactly. Releases no odor or bacteria and requires no dangerous chemicals or unpleasant handling. Stabilizes waste by natural process of biodegradation in which microbial activity eventually ceases and odors and bacteria reduced to easily contained levels. Simple and reliable and needs little maintenance.

B87-10305

ELECTRONIC INSPECTION OF BEEF

VICTOR J. ANSELMO (Caltech), PAUL M. GAMMELL (Caltech), and JERRY CLARK (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15477

Vol. 11, No. 6, P. 78

Two proposed methods for grading beef quality based on inspection by electronic equipment: one method uses television camera to generate image of a cut of beef as customer sees it; other uses ultrasonics to inspect live animal or unsliced carcasses. Both methods show promise for automated meat inspection.

B87-10373

PREHENSILE FOOT RESTRAINT

CHARLES A. WILLITS (Rockwell International Corp.)

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21071

Vol. 11, No. 7, P. 94

Proposed prehensile foot restraint enables such workers as astronauts and divers to maintain fixed positions in zero gravity or in buoyancy with minimal effort. With foot restraint worker devotes attention fully to task at hand, with little concern about holding on to supporting structure. Claw near toe of shoe grips rail. Wearer uses flexible shaft, first to lock claw tightly on bar; then, when work is done, to open claw. Underwater or in space, device boosts productivity.

B87-10439

CONTROLLING GROWTH RATES OF PROTEIN SAMPLES

FREDERICK T. HERRMANN, and BLAIR J. HERREN

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28182

Vol. 11, No. 8, P. 96

Apparatus enables control of humidity in chamber to control rates of growth of crystalline samples of protein. Size of drop of solution from which protein is grown made larger or smaller by condensation or evaporation of water. Situated between desiccant and water source, drop of protein solution shrinks or swells, according to which valve operator opens. Growing protein crystal viewed through polarizing film. Readily adapted to automation.

B87-10440

MIXING VALVE FOR PROTEIN-CRYSTAL GROWTH

DANIEL C. CARTER, and MARY BETH H. BROOM

Sep. 1987 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26047

Vol. 11, No. 8, P. 96

Apparatus for growing protein and other crystals holds reactants in separate chambers, then allows them to combine at proper time. Openings in cylindrical rotary valve connect chambers to each other selectively through internal passages. O-ring and strip seals prevent leakage over valve surface. Caps on chambers seal them tightly but are removable for addition of reactants or withdrawal of reaction products. Made from various chemically inert materials, and chambers designed with capacities ranging from milliliters to liters. Easily automated.

B87-10510

COLLECTOR/COMPACTOR FOR WASTE OR DEBRIS

JOHN K. MANGIALIARDI (General Electric Co.)

Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21196

Vol. 11, No. 9, P. 105

Device collects and compacts debris by sweeping through volume with net. Consists of movable vane, fixed vane, and elastic net connected to both vanes. Movable vane is metal strip curved to follow general contour of container with clearance to prevent interference with other parts on inside wall of container. One end of movable vane mounted in bearing and other end connected to driveshaft equipped with handle. User rotates movable vane, net stretched and swept through container. Captures most of debris coarser than mesh as it moves, compressing debris as it arrives at fixed vane. Applications include cleaning swimming pools and tanks.

B88-10050

BASIC PROGRAMMING IN WATER AND WASTEWATER ANALYSIS

THOMAS DRESCHER (Bionetics Corp.)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11298

Vol. 12, No. 1, P. 78

Collection of computer programs assembled for use in water-analysis laboratories. First program calculates quality-control parameters used in routine water analysis. Second calculates line of best fit for standard concentrations and absorbances entered. Third calculates specific conductance from conductivity measurement and temperature at which measurement taken. Fourth calculates any one of four types of residue measured in water. Fifth, sixth, and seventh calculate results of titrations commonly performed on water samples. Eighth converts measurements, to actual dissolved-oxygen concentration using oxygen-saturation values for fresh and salt water. Ninth and tenth perform calculations of two other common titrimetric analyses. Eleventh calculates oil and grease residue from water sample. Last two use spectro-photometric measurements of absorbance at different wavelengths and residue measurements. Programs included in collection written for Hewlett-Packard 2647F in H-P BASIC.

B88-10151

IMPLANTED BLOOD-PRESSURE-MEASURING DEVICE

ROBERT E. FISCHER (Johns Hopkins University)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13042

Vol. 12, No. 2, P. 98

Arterial pressure compared with ambient bodily-fluid pressure. Implanted apparatus, capable of measuring blood pressure of patient, includes differential-pressure transducer connected to pressure sensor positioned in major artery. Electrical signal is function of differential pressure between blood-pressure sensor and reference-pressure sensor transmitted through skin of patient to recorder or indicator.

B88-10152**BIOFEEDBACK WITH IMPLANTED BLOOD-PRESSURE DEVICE**

ROBERT E. RISCHHELL (Johns Hopkins University)
Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13043**Vol. 12, No. 2, P. 98**

Additional uses found for equipment described in 'Implanted Blood-Pressure-Measuring Device' (GSC-13042). Implanted with device electronic circuitry that measures, interprets, and transmits data via inductive link through patient's skin to external receiver. Receiver includes audible alarm generator activated when patient's blood pressure exceeds predetermined threshold. Also included in receiver a blood-pressure display, recorder, or both, for use by patient or physician.

B88-10153**HEAVY-DUTY RESCUE STRAPS FOR COVERALLS**

HENRY M. WADDELL (Rockwell International Corp.)
Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11295**Vol. 12, No. 2, P. 99**

New type of strap on coveralls helps rescuers lift victims of industrial accidents. Made of heavy twill. New material, 1 in. wide and has breaking strength of 600 lb, sewn to coveralls with polyester thread in box 'X' stitching. Reinforcing nylon webbing, 1 3/4 in. wide sewn with strap at attachment points.

B88-10154**SCREENING FOR ALCOHOL-PRODUCING MICROBES**

WAYNE W. SCHUBERT (Caltech)
Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15842**Vol. 12, No. 2, P. 99**

Dye reaction rapidly identifies alcohol-producing microbial colonies. Method visually detects alcohol-producing micro-organisms, and distinguishes them from other microbial colonies that do not produce alcohol. Method useful for screening mixed microbial populations in environmental samples.

B88-10208**REAL-TIME KERATOMETER**

ROBERT E. FRAZER (Caltech), IWAO P. ADACHI (Altovac, Inc.), and YOSHIFUMI ADACHI (Altovac, Inc.)
Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16701**Vol. 12, No. 3, P. 76**

Optical/electronic keratometer system produces contour map of corneal surface illuminated by infrared light pulses. Prevents operator error and eliminates need to apply fluorescent liquids to cornea. Keratometer provides both video display and numerical recording for corneal-transplant and radial-keratotomy surgery and for contact-lens fitting. Optical system of keratometer, circular grating pattern transmitted to corneal surface reflected onto identical circular grating on surface of fiber plate, producing Moire pattern. Data-analysis-and-display mode, laser light pulsed, and Moire pattern converted to digital information in frame grabber. Digital picture information sent to computer for processing and display.

B88-10396**PRESSURIZED SLEEVE**

AMY LERNER (ILC Dover, Inc.)
Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

MSC-21280**Vol. 12, No. 7, P. 80**

Garment part sustains pressure differential without unduly restricting the user. Sleeve withstands pressure difference of 8 lb/in² while allowing wearer fairly easy movement. Sleeve consists of low-torque joint hardware, sewn fabric sections, and lengthwise strips of fabric that restrain sections.

B88-10455**LIGHTWEIGHT HELMET FOR EYE/BALANCE STUDIES**

M. CATHERINE MCSTRAVICK (Technology, Inc.), DAVID R. PROCTOR (Technology, Inc.), and SCOTT J. WOOD (Technology, Inc.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21249**Vol. 12, No. 8, P. 98**

Lightweight helmet serves as mounting platform for stimulus and sensor modules in experiments on role of vestibulo-ocular reflex in motion sickness and space-adaptation syndrome. Fitted liner and five inflatable air bladders stabilize helmet with respect to subject's head. Personal bite board attached to chin-bar assembly makes hard palate in subject's mouth serve as final position reference for helmet.

B88-10456**FOOD-GROWING, AIR- AND WATER-CLEANING MODULE**

R. L. SAUER, H. W. SCHELD (Phytoresearch Research, Inc.), and J. W. MAFNUSON (Phytoresearch Research, Inc.)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21301**Vol. 12, No. 8, P. 98**

Apparatus produces fresh vegetables and removes pollutants from air. Hydroponic apparatus performs dual function of growing fresh vegetables and purifying air and water. Leafy vegetables rooted in granular growth medium grow in light of fluorescent lamps. Air flowing over leaves supplies carbon dioxide and receives fresh oxygen from them. Adaptable to production of food and cleaning of air and water in closed environments as in underwater research stations and submarines.

B88-10457**THREE-DIMENSIONAL ULTRASONIC IMAGING OF THE CORNEA**

RRICHAR C. HEYSER (Caltech), and JAMES A. ROONEY (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16570**Vol. 12, No. 8, P. 99**

Proposed technique generates pictures of curved surfaces. Object ultrasonically scanned in raster pattern generated by scanning transmitter/receiver. Receiver turned on at frequent intervals to measure depth variations of scanned object. Used for medical diagnoses by giving images of small curved objects as cornea. Adaptable to other types of reflection measurements systems such as sonar and radar.

B88-10553**CONTROL ALGORITHMS FOR LIQUID-COOLED GARMENTS**

B. DREW (United Technologies Corp.), K. HARNER (United Technologies Corp.), E. HODGSON (United Technologies Corp.), J. HOMA (United Technologies Corp.), D. JENNINGS (United Technologies Corp.), and J. YANOSY (United Technologies Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21349 Vol. 12, No. 10, P. 81

Three algorithms developed for control of cooling in protective garments. Metabolic rate inferred from temperatures of cooling liquid outlet and inlet, suitably filtered to account for thermal lag of human body. Temperature at inlet adjusted to value giving maximum comfort at inferred metabolic rate. Applicable to space suits, used for automatic control of cooling in suits worn by workers in radioactive, polluted, or otherwise hazardous environments. More effective than manual control, subject to frequent, overcompensated adjustments as level of activity varies.

**B88-10554
EXTENDING THE SHELF LIFE OF BLOOD PLATELETS**

DOUGLAS M. SURGENOR (The Center For Blood Research)
Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21157 Vol. 12, No. 10, P. 81

New method of storing human blood platelets extends vitality for transfusions. Packaged as suspension in sterile liquid in plastic blood bags. Each bag placed between pair of plastic grids, and rubberbands placed around sandwich thus formed to hold together. Stored upright in open air or in container through which air pumped at rate of at least 45 L/min. Ensures that platelets receive ample oxygen and expiratory carbon dioxide from platelets removed before pH drops to harmful levels.

**B88-10555
SOLAR REFRIGERATOR/FREEZERS FOR VACCINES**

ANTHONY F. RATAJCZAK
Nov. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-11666 and N87-18230)

LEW-14549 Vol. 12, No. 10, P. 82

Report presents results of field tests of solar-cell-powered refrigerator/freezers for vaccines. Covers following topics: explanation of project; descriptions of refrigerator/freezer systems; account of installation experiences; performance data for 22 systems for which field-test data reported; summary of operational reliability; comments of users of some systems tested; and recommendations for design and future use. Photovoltaic systems store vaccines in remote regions where powerlines unavailable.

**B88-10617
EXPERIMENTING WITH BARORECEPTOR REFLEXES**

DWAIN L. ECKBERG (Virginia Commonwealth University), and ROSS L. GOBLE (Engineering Development Laboratory)
Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21388 Vol. 12, No. 11, P. 92

Carotid arteries stimulated by pressure or suction on neck. Baro-Cuff is silicone-rubber chamber that fits on front of subject's neck. Electronic system, stepping motor, bellows, and umbilical tube furnish controlled pressure to chamber. Pressure sensor provides feedback to microprocessor in electronic system. Developed to study blood-pressure-reflex responses of astronauts in outer space. Useful for terrestrial studies of patients with congestive heart failure, chronic diabetes mellitus, and other conditions in which blood-pressure-reflex controls behave abnormally.

**B88-10618
MEASURING TIME-AVERAGED BLOOD PRESSURE**

NEIL S. ROTHMAN (Johns Hopkins University)
Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13044 Vol. 12, No. 11, P. 93

Device measures time-averaged component of absolute blood pressure in artery. Includes compliant cuff around artery and external monitoring unit. Ceramic construction in monitoring unit suppresses ebb and flow of pressure-transmitting fluid in sensor chamber. Transducer measures only static component of blood pressure.

**B89-10099
FUNCTIONAL MICROSPHERES**

ALAN REMBAUM (Caltech), and SHLOMO MARGEL (Caltech)
Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-14687 Vol. 13, No. 2, P. 93

Tiny beads develop from aqueous solution. Process forms beads of polyglutaraldehyde directly from solution. Beads of 0.5-to-1.0-micron diameter with fluorescent or magnetic properties made. Fluorescent or magnetic properties allow marked cells to be traced and identified. Useful in biology, clinical chemistry, and biochemistry.

**B89-10151
MANDRELS FOR MICROTEXTURED SMALL-VESSEL IMPLANTS**

WILLIAM D. DEININGER (Caltech), and STEPHEN B. GABRIEL (Caltech)
Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16690 Vol. 13, No. 3, P. 88

Research shows artificial blood-vessel and heart-valve implants made more compatible with their biological environments by use of regularly microtextured surfaces. In new manufacturing process, ion beam etches patterned array of small pillars on mandrel used to mold tubular plastic implant. Pillars create tiny regularly spaced holes in inner surface of tube. Holes expected to provide sites for attachment of healthy lining. Polytetrafluoroethylene (PTFE) used as mandrel material because it can be etched by ion beam.

**B89-10152
MULTIMEMBRANE BIOREACTOR**

TOOHYON CHO (Cornell Univ.), and MICHAEL L. SHULER (Cornell Univ.)
Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17199 Vol. 13, No. 3, P. 88

Set of hydrophilic and hydrophobic membranes in bioreactor allows product of reaction to be separated, while nutrients fed to reacting cells and byproducts removed from them. Separation process requires no externally supplied energy; free energy of reaction sufficient. Membranes greatly increase productivity of metabolizing cells by continuously removing product and byproducts, which might otherwise inhibit reaction, and by continuously adding oxygen and organic nutrients.

**B89-10337
AUTOMATIC SPROUT GROWER**

RICHARD L. SAUER, H. W. SCHELD (Phytoresource Research, Inc.), and J. W. MAGNUSON (Phytoresource Research, Inc.)
Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21266 Vol. 13, No. 6, P. 106

Self-contained seed-sprouting system provides environment for sprouting seeds quickly and easily. Sprouting container standard 6-oz package for dehydrated food and drink mixes in Space Shuttle. About 4 g of dry alfalfa or radish seeds vacuum-sealed in each

cup, like freeze-dried foods. Sixteen cups suspended in tray. Air-and-water inlet tube links each cup to system of tubes and solenoid valves alternately furnish air and water and remove stale air. Peristaltic pump supplies water from vinyl medical-fluid bag. Small diaphragm pump supplies and exhausts air. Small circuit board times movements of air and water. Kit offers advantages to home gardeners. Apartment dwellers use it for steady production of homegrown sprouts even though they have no garden space.

B89-10425**DEPTH PERCEPTION IN REMOTE STEREOSCOPIC VIEWING SYSTEMS**

DANIEL B. DINER (Caltech), and MARIKA VON SYDOW (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17118**Vol. 13, No. 8, P. 88**

Report describes theoretical and experimental studies of perception of depth by human operators through stereoscopic video systems. Purpose of such studies to optimize dual-camera configurations used to view workspaces of remote manipulators at distances of 1 to 3 m from cameras. According to analysis, static stereoscopic depth distortion decreased, without decreasing stereoscopic depth resolution, by increasing camera-to-object and intercamera distances and camera focal length. Further predicts dynamic stereoscopic depth distortion reduced by rotating cameras around center of circle passing through point of convergence of viewing axes and first nodal points of two camera lenses.

B89-10492**USING INORGANIC CRYSTALS TO GROW PROTEIN CRYSTALS**

PAUL J. SHLICHTA (Caltech), and ALEXANDER A. MCPHERSON (California Univ.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17314**Vol. 13, No. 9, P. 123**

Solid materials serve as nucleating agents. Protein crystals induced by heterogeneous nucleation and in some cases by epitaxy to grow at lower supersaturations than needed for spontaneous nucleation. Heterogeneous nucleation makes possible to grow large, defect-free single crystals of protein more readily. Such protein crystals benefits research in biochemistry and pharmacology.

B89-10493**MEASURING PHYTOPLANKTON FROM SATELLITES**

C. O. DAVIS (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17608**Vol. 13, No. 9, P. 124**

Present and future methods examined. Report reviews methods of calculating concentration of phytoplankton from satellite measurements of color of ocean and using such calculations to estimate productivity of phytoplankton.

B89-10537**CONTROLLED-TURBULENCE BIOREACTORS**

DAVID A. WOLF, RAY SCHWARTZ (Technology, Inc.), and TINH TRINH (Krug International)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21293 MSC-21294**Vol. 13, No. 10, P. 74**

Two versions of bioreactor vessel provide steady supplies of

oxygen and nutrients with little turbulence. Suspends cells in environment needed for sustenance and growth, while inflicting less damage from agitation and bubbling than do propeller-stirred reactors. Gentle environments in new reactors well suited to delicate mammalian cells. One reactor kept human kidney cells alive for as long as 11 days. Cells grow on carrier beads suspended in liquid culture medium that fills cylindrical housing. Rotating vanes - inside vessel but outside filter - gently circulates nutrient medium. Vessel stationary; magnetic clutch drives filter cylinder and vanes. Another reactor creates even less turbulence. Oxygen-permeable tubing wrapped around rod extending along central axis. Small external pump feeds oxygen to tubing through rotary coupling, and oxygen diffuses into liquid medium.

B89-10587**CLEANING ANIMALS' CAGES WITH LITTLE WATER**

BENJAMIN J. HARMAN (Boeing Co.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28275**Vol. 13, No. 11, P. 88**

Proposed freeze/thaw method for cleaning animals' cages requires little extra weight and consumes little power and water. Cleaning concept developed for maintaining experimental rat cages on extended space missions. Adaptable as well to similar use on Earth. Reduces cleaning time. Makes use of already available facilities such as refrigerator, glove box, and autoclave. Rat waste adheres to steel-wire-mesh floor of cage. Feces removed by loosening action of freezing-and-thawing process, followed by blast of air.

B89-10588**MICROENCAPSULATION OF LIVING CELLS**

MANCHU CHANG (Caltech), JAMES M. KENDALL (Caltech), and TAYLOR G. WANG (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17434**Vol. 13, No. 11, P. 88**

In experimental technique, living cells and other biological materials encapsulated within submillimeter-diameter liquid-filled spheres. Sphere material biocompatible, tough, and compliant. Semipermeable, permitting relatively small molecules to move into and out of sphere core but preventing passage of large molecules. New technique promises to make such spherical capsules at high rates and in uniform, controllable sizes. Capsules injected into patient through ordinary hypodermic needle. Promising application for technique in treatment of diabetes. Also used to encapsulate pituitary cells and thyroid hormone adrenocortical cells for treatment of other hormonal disorders, to encapsulate other secreting cells for transplantation, and to package variety of pharmaceutical products and agricultural chemicals for controlled release.

B89-10589**EFFECTS OF VIBRATIONS ON GRASP CONTROL**

BLAKE HANNAFORD (Caltech), and WILLIAM H. ROSAR (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17698**Vol. 13, No. 11, P. 90**

Vibration powerful and specific stimulus to low-level reflex behavior. Report describes experiments on interactions between human operators and hand control device for control of extent of opening and gripping force of remote gripper. Major purpose of study to determine effects of vibrations in device upon ability of operators to control gripping force. Used beneficially in design of controls to provide warning signals preventing operators from commanding excessive, or perhaps insufficient forces.

B90-10042**DRY-ENZYME TEST FOR GASEOUS CHEMICALS**

EDUARDO BARZANA (Massachusetts Inst. of Tech.), MARCUS KAREL (Massachusetts Inst. of Tech.), and ALEXANDER KLIBANOV (Massachusetts Inst. of Tech.)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17642**Vol. 14, No. 1, P. 74**

Simple, dry-chemical test detects ethanol in human breath. Method of test also adapted to detection of such toxic chemicals as formaldehyde in airstreams. Used qualitatively to detect chemical compounds above present level; for example, ethanol above legal level for driving. Also used to indicate quantitatively concentrations of compounds. Involves dry enzyme and color indicator. Adapted to detect any gaseous compound transformed by enzymes to produce change evident to human eye or to instrument.

B90-10043**FLOWS IN MODEL HUMAN FEMORAL ARTERIES**

LLOYD H. BACK (Caltech), EUG Y. KWACK (Caltech), and DONALD W. CRAWFORD (University of Southern California)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17599**Vol. 14, No. 1, P. 76**

Flow is visualized with dye traces, and pressure measurements made. Report describes experimental study of flow in models of human femoral artery. Conducted to examine effect of slight curvature of artery on flow paths and distribution of pressure.

B90-10044**COMPUTER ANIMATION IN PERCEPTION RESEARCH**

MARY K. KAISER, and DENNIS R. PROFFITT (University of Virginia)

Jan. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-14845) Applications of Computer-Graphics Animation for Motion-Perception Research.

ARC-11774**Vol. 14, No. 1, P. 76**

Artificiality of images apparent to subjects and influences experimental results. Report evaluates computer-generated animation in research on perception of motion. Such research programs not pursued without computer animation, report notes. Computer-generated displays afford variability and control almost impossible to achieve otherwise. Medium limited in that computer-generated images present simplified approximations of dynamics of natural events.

B90-10083**AEROSPACE FOOD TRAY**

MAUREEN A. ARAGON (Lockheed Engineering and Management Services Co., Inc.), and MICHAEL F. FOHEY (Krug International)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21412**Vol. 14, No. 2, P. 72**

Lightweight tray designed for use in microgravity. Provides restraint and thermal insulation for modular packages of food. Magnetic utensils restrained by attraction to ferrous plate mounted underneath. Restraints for pouch and spring clips also provided. Surfaces made smooth to facilitate cleaning, and number of cracks, crevices, and pits where food residues collect kept to minimum. Useful for serving meals in airplanes, boats, hospitals, and facilities that care for children.

B90-10254**SENSOR DETECTS OVERHEATING OF PERISHABLE MATERIAL**

JONATHAN S. DORDICK (Massachusetts Inst. of Tech.), and ALEXANDER KLIBANOV (Massachusetts Inst. of Tech.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17585**Vol. 14, No. 5, P. 95**

Experimental temperature sensor changes color rapidly and irreversibly when temperature rises above pre-determined level. Based on reactions of enzymes in paraffins, blended so mixture melts at temperature considered maximum safe value. Similar devices used to detect temperature abuse, whether foods or medicines refrigerated exposed to excessive temperatures during shipment and storage. By viewing sensor, receiving clerk tells immediately whether product maintained at safe temperatures and acceptable.

B90-10310**AFFINITY ELECTROPHORESIS USING LIGANDS ATTACHED TO POLYMERS**

JAMES M. VAN ALSTINE (Universities Space Research Association), ROBERT S. SNYDER (Universities Space Research Association), J. M. HARRIS (Universities Space Research Association), and D. E. BROOKS (Universities Space Research Association)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26049**Vol. 14, No. 6, P. 95**

In new technique, reduction of electrophoretic mobilities by addition of polyethylene glycol to ligands increases electrophoretic separabilities. In immuno-affinity electrophoresis, modification of ligands extends specificity of electrophoretic separation to particles having surface electric-charge structures otherwise making them electrophoretically inseparable. Modification of antibodies by polyethylene glycol greatly reduces ability to aggregate while enhancing ability to affect electrophoretic mobilities of cells. In hydrophobic-affinity electrophoresis, addition of polyethylene glycol reduces tendency toward aggregation of cells or macromolecules.

B90-10311**HOLLOW-FIBER CLINOSTAT**

PERCY H. RHODES, TERESA Y. MILLER, and ROBERT S. SNYDER

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28370**Vol. 14, No. 6, P. 96**

Hollow-fiber clinostat, is bioreactor used to study growth and other behavior of cells in simulated microgravity. Cells under study contained in porous hollow fiber immersed in culture medium inside vessel. Bores in hollow fiber allow exchange of gases, nutrients, and metabolic waste products between living cells and external culture media. Hollow fiber lies on axis of vessel, rotated by motor equipped with torque and speed controls. Desired temperature maintained by operating clinostat in standard tissue-culture incubator. Axis of rotation made horizontal or vertical. Designed for use with conventional methods of sterilization and sanitation to prevent contamination of specimen. Also designed for asepsis in assembly, injection of specimen, and exchange of medium.

B90-10312**SELF-CALIBRATING RESPIRATORY-FLOWMETER COMBINATION**

DWAYNE R. WESTENSKOW (Utah Univ.), and JOSEPH A. ORR (Utah Univ.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21430**Vol. 14, No. 6, P. 96**

Dual flowmeters ensure accuracy over full range of human

respiratory flow rates. System for measurement of respiratory flow employs two flowmeters; one compensates for deficiencies of other. Combination yields easily calibrated system accurate over wide range of gas flow.

B90-10377

PERFUSION BIOREACTOR MODULE

DENNIS R. MORRISON

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21361

Vol. 14, No. 7, P. 113

Perfusion bioreactor module, self-contained, closed-loop cell-culture system that operates in microgravity or on Earth. Equipment supports growth or long-term maintenance of cultures of human or other fragile cells for experiments in basic cell biology or process technology. Designed to support proliferation (initially at exponential rates of growth) of cells in complex growth medium and to maintain confluent cells in defined medium under conditions optimized to permit or encourage selected functions of cells, including secretion of products of cells into medium.

B90-10433

MATHEMATICAL MODEL OF NERVE/MUSCLE INTERACTION

BLAKE HANNAFORD (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17816

Vol. 14, No. 8, P. 73

Phasic Excitation/Activation (PEA) mathematical model simulates short-term nonlinear dynamics of activation and control of muscle by nerve. Includes electronic and mechanical elements. Is homeomorphic at level of its three major building blocks, which represent motoneuron, dynamics of activation of muscle, and mechanics of muscle.

B90-10434

IMPLANTABLE ELECTRODE FOR CRITICAL LOCATIONS

EARL R. COLLINS, JR. (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17264

Vol. 14, No. 8, P. 74

Implantable electrode holds itself in place until body tissue grows around it and retains it. Sheath covers electrode during implantation. Partially retracted after implantation and completely retracted after growth of tissue onto electrode. Intended to provide electrical stimuli to muscles having become inactive through accident or disease. Helps paraplegics and others to exercise voluntary control over arms and legs.

B90-10435

LIQUID-AIR BREATHING APPARATUS

ROBERT D. MILLS (EG and G Florida, Inc.)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11431

Vol. 14, No. 8, P. 74

Compact unit supplies air longer than compressed-air unit. Emergency breathing apparatus stores air as cryogenic liquid instead of usual compressed gas. Intended for firefighting or rescue operations becoming necessary during planned potentially hazardous procedures.

B90-10503

EMULSIONS CONTAINING PERFLUOROCARBON SUPPORT CELL CULTURES

LU-KWANG JU, JAW FANG LEE, and WILLIAM B. ARMIGER
Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21480

Vol. 14, No. 9, P. 99

Addition of emulsion containing perfluorocarbon liquid to aqueous cell-culture medium increases capacity of medium to support mammalian cells. FC-40 Fluorinert (or equivalent) - increases average density of medium so approximately equal to that of cells. Cells stay suspended in medium without mechanical stirring, which damages them. Increases density enough to prevent cells from settling, and increases viscosity of medium so oxygen bubbled through it and nutrients stirred in with less damage to delicate cells.

B90-10684

GROWING AND ASSEMBLING CELLS INTO TISSUES

DAVID A. WOLF, RAY P. SCHWARZ (Krug International), MARIAN L. LEWIS (Krug International), JOHN H. CROSS (Krug International), and M. HELEN HULS (Krug International)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21559

Vol. 14, No. 12, P. 67

Laboratory process for growth and assembly of mammalian cells into tissue-like masses demonstrated with hamster and rat cells. New process better able to provide culture environment with reduced fluid shear stress, freedom for three-dimensional spatial orientation of particles suspended in culture medium, and localization of particles of different or similar sedimentation properties in similar spatial region.

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B86-10044

CRADLES FOR SUPPORT IN TRANSIT

W. H. CRANE (Lockheed Missiles & Space Co., Inc.), and H. T. FISHER (Lockheed Missiles & Space Co., Inc.)
Jun. 1986

MSC-20725

Vol. 10, No. 1, P. 92

C-shaped cradles distribute weight of large objects. Originally developed for holding satellite in bay of Space Shuttle orbiter, concept also adaptable to such terrestrial uses as carrying odd-shaped equipment by truck. Cradle set consists of single prime cradle and several basic cradles. Composed of bar bent into a half circle, each cradle has own keel and longeron trunnions that brace structure by mating with receptacles in vehicle and its own foam pads, on which load rests. One 548-lb (249-kg) cradle supports up to 3,000 lb (1,361 kg); thus, 15,000-lb (6,800-kg) object requires five cradles distributed along its length. Through their trunnions, cradles spread weight of load along vehicle.

B86-10045

INTERNALLY WRENCHING NUT

R. G. CORTES (Rockwell International Corp.)
Jun. 1986

MFS-29068

Vol. 10, No. 1, P. 93

Less space needed for installation and removal. Nut for use with short bolts torqued with allen wrench. In contrast with standard hexagonal nuts, new nut requires no external wrench clearance

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on installation surface. Nut has many uses in assemblies where space is limited, especially in automotive and aircraft industries.

B86-10046

SELF-ALIGNING END SUPPORTS FOR ENERGY ABSORBER

E. ALFARO-BOU, C. P. EICHELBERGER, and E. FASANELLA
(Kentron International, Inc.)

Jun. 1986

Vol. 10, No. 1, P. 94

LAR-13295
Simple devices stabilize axially-loaded compressive members. Energy-absorbing column held by two end supports, which stabilize column and tolerate misalignment. Column absorbs excess load by collapsing lengthwise. Self-aligning supports small, lightweight, and almost maintenance-free. Their use eliminates alignment problem, opening up more applications and providing higher reliability for compressively-loaded energy absorbers.

B86-10047

COMBINED DEVICES FOR TURBULENT-DRAG REDUCTION

M. J. WALSH, JOHN B. ANDERS, JR., and J. N. HEFNER

Jun. 1986

Vol. 10, No. 1, P. 94

LAR-13286
Aircraft skin-friction drag reduced as much as 15 percent. One effective drag-reduction technique involves use of riblets. Riblets are longitudinal striations or grooves machined on originally smooth surface. Grooves aligned with flow. Grooves have depths and spacings on order of turbulent wallstreak and burst dimensions and designed to change near-wall structure of turbulent boundary layer. Another approach, using large-eddy-breakup (LEBU) devices, or turbulence manipulators or ribbons also demonstrated reductions in local skin friction and net drag in air. LEBU device consists of thin, ribbonlike strips or airfoils suspended parallel to test surface and positioned within turbulent boundary layer. Technique potentially reduce net skin-friction drag by at least 15 percent on turbulent boundary layer of aircraft, representing possible annual savings in fuel costs of \$300 to \$400 million for U.S. commercial fleet. Also applicable to frictionless reduction inside pipes and ducts, contributing to increased efficiency of pumps, heat exchangers, air conditioners, and other devices involving fluid flow.

B86-10048

CLIP-ON EXTENSOMETER

A. M. C. HOLMES (Lockheed Missiles & Space Co., Inc.), and M. C. DUGGAN (Lockheed Missiles & Space Co., Inc.)

Jun. 1986

Vol. 10, No. 1, P. 96

MSC-20710
Flexural clamp eliminates problems of operator variability. Extensometer opens and closes like clothespin and placed easily on specimen. Dimensions of block specimen are 1 by 1 by 2.2 inches (2.54 by 2.54 by 5.59 centimeters). By constructing central flexure units of various widths, one adapts extensometer to handle specimens ranging from thin strips to those many inches thick. New design reduces measurement errors caused by variability among test operators.

B86-10049

PRECISE-CONDUCTANCE VALVE INSERT

R. A. OUTLAW, and R. F. HOYT

Jun. 1986

Vol. 10, No. 1, P. 97

LAR-13340
Valve modification provides two operating modes fully open and small, precise leak. Copper insert with radially oriented holes allows small, controllable, precise effusion rate when valve closed or nearly unobstructed flow when valve open. Numerous applications in surface physics, vacuum physics, materials science, gas kinetics, thin films, and other areas of research requiring measured flows of gas into or out of system.

B86-10050

DETECTING CAVITATION PITTING WITHOUT DISASSEMBLY

S. BARKHOUDARIAN (Rockwell International Corp.)

Jun. 1986

Vol. 10, No. 1, P. 98

MFS-19902
Technique for detecting cavitation pitting in pumps, turbines, and other machinery uses low-level nuclear irradiation. Isotopes concentrated below surface emit gamma radiation, a portion of which is attenuated by overlying material. Where there are cavitation pits, output of gamma-ray detector fluctuates as detector is scanned near pits. Important to detect cavitation pits because nozzle, turbine blade, or other pump component weakened by cavitation could fail catastrophically and cause machine to explode.

B86-10051

A RAPID ATTACHMENT OF STRAIN GAGES

T. D. SCHOTT, R. L. FOX, and J. D. BUCKLEY

Jun. 1986

Vol. 10, No. 1, P. 98

LAR-13237
Hand-held toroidal gun concentrates heat in localized area. New method for bonding film gages eliminates time-consuming oven curing. Hand-held 'gun,' operates on induction heating to concentrate heat in localized area. Ferritic plate added for low-reluctance or no-reluctance surfaces.

B86-10052

EASILY ACCESSIBLE CAMERA MOUNT

H. E. CHALSON (PRC Systems Services)

Jun. 1986

Vol. 10, No. 1, P. 99

KSC-11316
Modified mount enables fast alignment of movie cameras in explosionproof housings. Screw on side and readily reached through side door of housing. Mount includes right-angle drive mechanism containing two miter gears that turn threaded shaft. Shaft drives movable dovetail clamping jaw that engages fixed dovetail plate on camera. Mechanism aligns camera in housing and secures it. Reduces installation time by 80 percent.

B86-10053

GRAPHICAL METHOD FOR PREDICTING STEADY-STATE TEMPERATURE

ROBERT L. CASE, JR. (Rockwell International Corp.)

Jun. 1986

Vol. 10, No. 1, P. 100

MSC-20835
Temperature that heated or cooled passive system will reach is predicted from temperature-versus-time curves. Intersection of two lines in graphical construction gives asymptotic temperature of system. Developed for analyzing thermal anomalies during flights of Space Shuttle, graphical method also applicable to everyday heating and cooling problems.

B86-10054

ICE DETECTOR FOR AIRCRAFT

L. M. WEINSTEIN

Jun. 1986

Vol. 10, No. 1, P. 100

LAR-13403
Thickness of ice on aircraft measured by flush-mounted sensor. Detector consists of following: flush-mounted sensor with three separate components, temperature-measuring circuit, configuration of which is based on type of sensor used, two capacitance-measuring circuits, and logic circuit that uses outputs of other three circuits to determine presence of ice and its thickness. Information required to determine whether efforts to remove ice, such as heating or change in flight speed or elevation, should be initiated.

B86-10055**HIGH-PERFORMANCE HEAT PIPE WITH SCREEN MESH**

J. P. ALARIO (Grumman Aerospace Corp.), R. F. BROWN (Grumman Aerospace Corp.), and R. KOSSON (Grumman Aerospace Corp.)

Jun. 1986

MSC-20497

Vol. 10, No. 1, P. 101

Liquid distributed more evenly in evaporator section. Improved heat pipe contains an artery and wick rolled from stainless-steel screen of 180 mesh (openings about 80 micrometers). Screen material helps to prevent dryout in evaporator section by conducting liquid through hotspots and to vaporchannel wall. Insert reduces incidence of dryout at hotspots or during intervals of general thermal overload.

B86-10056**MEASURING GEARBOX TORQUE LOSS**

L. F. SCHMIDT (Caltech)

Jun. 1986

NPO-15794

Vol. 10, No. 1, P. 102

Accuracy increased by measuring small torque differences directly. Input and output torques are balanced by mechanical linkage in transmission-testing apparatus. Force applied to load cell proportional to frictional torque loss in transmission. Apparatus measures portion of input torque lost to friction in automotive transmissions or other gearbox. Apparatus more sensitive than previous measuring systems.

B86-10057**MEASURING HEAT-EXCHANGER WATER LEAKAGE**

J. ZAMPICENI (United Technologies Corp.)

Jun. 1986

MSC-20811

Vol. 10, No. 1, P. 103

Water leakage in heat exchanger measured directly with help of electrolytic hygrometer. In new technique, flow of nitrogen gas set up in one loop of heat exchanger. Other loop filled with water under pressure. Water concentration produced by leakage of water into nitrogen flow measured by hygrometer. New measurement method determines water concentrations up to 2,000 parts per million with accuracy of ± 5 percent.

B86-10058**OPTIMIZED BOLTED JOINT**

L. J. HART-SMITH (McDonnell Douglas Corp.), B. L. BUNIN (McDonnell Douglas Corp.), and D. J. WATTS (McDonnell Douglas Corp.)

Jun. 1986 See Also (X83-10287)

LAR-13250

Vol. 10, No. 1, P. 103

Computer technique aids joint optimization. Load-sharing between fasteners in multirow bolted composite joints computed by nonlinear-analysis computer program. Input to analysis was load-deflection data from 180 specimens tested as part of program to develop technology of structural joints for advanced transport aircraft. Bolt design optimization technique applicable to major joints in composite materials for primary and secondary structures and generally applicable for metal joints as well.

B86-10059**LASER HOLDER AIDS CENTERING OF X-RAY HEAD**

D. V. BULTHUIS (Rockwell International Corp.), and D. D. KETTERING (Rockwell International Corp.)

Jun. 1986

MFS-29067

Vol. 10, No. 1, P. 104

Laser holder used when aligning X-ray head makes procedure safer and more reliable. Laser holder assembly attached to X-ray head to enable head to be aligned optically before X-ray exposure. When laser in operating position laser beam shines on spot later illuminated with X-rays. New holder grips laser securely, maintains

alignment, does not interfere with head placement, and requires only one 110-V power cord.

B86-10060**HIGHER SENSITIVITY IN X-RAY PHOTOGRAPHY**

R. N. BUGGLE (Honeywell, Inc.)

Jun. 1986

MFS-28026

Vol. 10, No. 1, P. 105

Hidden defects revealed if X-ray energy decreased as exposure progresses. Declining-potential X-ray photography detects fractures in thin metal sheet covered by unbroken sheet of twice thickness. Originally developed to check solder connections on multilayer circuit boards, technique has potential for other nondestructive testing.

B86-10061**SIMPLIFIED RIDE-COMFORT PROGRAM**

J. D. LEATHERWOOD, and L. M. BARKER (System Development Corp.)

Jun. 1986

LAR-13289

Vol. 10, No. 1, P. 107

Vibration and noise contributions to discomfort quantified. RIDEQUL estimates passenger ride comfort within air- and surface-transportation systems. Provides engineers with reliable method of objectively predicting and evaluating vehicle ride quality. Transforms individual elements of noise and vibration characteristics of vehicle into subjective units and combines these units to produce single discomfort index. Program written in FORTRAN 77 for interactive or batch execution.

B86-10143**ANALYZING STATIC LOADING OF COMPLEX STRUCTURES**

D. C. GALLEAR (Rockwell International Corp.)

May 1986

MSC-20896

Vol. 10, No. 2, P. 98

Critical loading conditions determined from analysis of each structural element. Automated Thrust Structures Loads and Stresses (ATLAS) system is series of programs developed to analyze elements of complex structure under static-loading conditions. ATLAS calculates internal loads, beam-bending loads, column- and web-buckling loads, beam and panel stresses, and beam-corner stresses. Programs written in FORTRAN IV and Assembler for batch execution.

B86-10144**SHADOWED SPACE HEATING OF SPARSE STRUCTURES**

J. L. ONEILL (General Dynamics Corp.), and J. L. ZICH (General Dynamics Corp.)

May 1986

LEW-13977

Vol. 10, No. 2, P. 98

Complete heat-flux and temperature maps computed. Computer program SSQ developed to address and quantify complex, solar-shadowing conditions inherent in sparse, lattice-type space structures. Analysis procedure one of assessing partial shadowing of structural elements by multiple, similar slender members. Program yields schedules of incident-solar, Earth-thermal, and Earth-albedo radiation throughout complete orbit for elemental locations on selected structural members. Thermal response computed in optional routine. Complete heat-flux and temperature mapping obtained by repeated computations for selected elements of interest.

B86-10145**RENDEZVOUS BET PROGRAM**

W. M. LEAR (TRW, Inc.)

May 1986

MSC-20785

Vol. 10, No. 2, P. 98

Computes relative positions of two vehicles in concentric orbits. LRBET3 program best-estimate-of-trajectory (BET) calculation for postflight trajectory analysis of Shuttle orbital rendezvous maneuvers. LRBET3 produces estimated measurements for reconstructing relative positions of two vehicles. Kalman filter and smoothing filter applied to relative measurement input data to estimate state vector, reduce noise, and produce BET output. BET calculation minimizes variances of all trajectory estimation errors. LRBET3 written in FORTRAN IV for batch execution.

B86-10146

VARIABLE-CONDUCTANCE HEAT PIPES

D. ANTONIUK (TRW, Inc.)

May 1986

LEW-14075

Vol. 10, No. 2, P. 100

In response to need to accurately and efficiently predict performance of variable-conductance heat pipes (VCHP's) incorporated in spacecraft thermalcontrol systems, computer code VCHPDA developed to interact with thermal analyzer programs such as SINDA (Systems Improved Numerical Differencing Analyzer). Calculates length of gas-blocked region and vapor temperature in active portion. Advantages of VCHPDA over prior programs improved accuracy, unconditional stability, and increased efficiency of solution resulting from novel approach and use of state-of-the-art numerical techniques for solving VCHP mathematical model. Code valuable tool in design and evaluation of advanced thermal-control systems using variable-conductance heat pipes. Written in FORTRAN IV for use on CDC 600 computers.

B86-10147

PROGRAMING STRUCTURAL SYNTHESIS SYSTEM

JAMES L. ROGERS, JR

May 1986

LAR-13408

Vol. 10, No. 2, P. 100

Program aids research in analysis and optimization. Programing Structural Synthesis System (PROSSS2) developed to provide structural-synthesis capability by combining access to SPAR with CONMIN program and set of interface procedures. SPAR is large general-purpose finite-element structural-analysis program, and CONMIN is large general-purpose optimization program. PROSSS2 written in FORTRAN IV for batch execution.

B86-10148

VIBRATION-RESPONSE ANALYSIS

L. M. BOWMAN (U.S. Army Aviation Systems Command)

Jun. 1986

LAR-13291

Vol. 10, No. 2, P. 100

Dynamic behaviors of structures analyzed interactively. Interactive steady-state vibration-response program, VIBRA, developed. Frequency-response analyses commonly used in evaluating dynamic behaviors of structures subjected to cyclic external forces. VIBRA calculates frequency response using modalsuperposition approach. Method applicable to single or multiple forces applied to linear, proportionally damped structure in which damping is viscous or structural. VIBRA written in FORTRAN 77 for interactive execution.

B86-10149

FATIGUE-CRACK-GROWTH STRUCTURAL ANALYSIS

J. C. NEWMAN, JR.

May 1986

LAR-13412

Vol. 10, No. 2, P. 102

Elastic and plastic deformations calculated under variety of loading conditions. Prediction of fatigue-crack-growth lives made with FatigueCrack-Growth Structural Analysis (FASTRAN) computer program. As cyclic loads are applied to initial crack configuration, FASTRAN predicts crack length and other parameters until complete break occurs. Loads are tensile or compressive and of

variable or constant amplitude. FASTRAN incorporates linear-elastic fracture mechanics with modifications of load-interaction effects caused by crack closure. FASTRAN considered research tool, because of lengthy calculation times. FASTRAN written in FORTRAN IV for batch execution.

B86-10160

QUICK-CONNECT HEAVY-DUTY FASTENER

D. M. MOORE (Caltech)

Jun. 1986

NPO-16370

Vol. 10, No. 2, P. 108

Attaching device combines fast connection and disconnection with high strength. T-shaped stud engages groove in receptacle after one-quarter turn. Further turning tightens nut on receptacle. Like quarter-turn attaching devices, connected and disconnected quickly. Like threaded devices, adjusted to desired preload, withstand high loads, and accommodate wide range of grip lengths.

B86-10161

STABLE EJECTION SEAT

R. S. HIRSCH (Rockwell International Corp.)

Jun. 1986

MSC-20780

Vol. 10, No. 2, P. 109

Drogue chute for ejection seat slows down seat in more stable fashion than conventional parachutes and thus improves chances for survival. Square drogue linked to seat from its corners suppresses tendency of seat to rotate in pitch and yaw. New parachute expected to reduce dynamic forces on ejected person and extend maximum possible ejection altitude by 50 percent. Used at high or low speeds.

B86-10162

FINITE-ELEMENT FRACTURE ANALYSIS OF PINS AND BOLTS

K. J. NORD (Teledyne Brown Engineering Corp.)

Jun. 1986

MFS-28061

Vol. 10, No. 2, P. 110

Stress intensities calculated in bending and tension. Finite-element stress-analysis method gives stress-intensity estimates for surface flaws on smooth and threaded round bars. Calculations done for purely tensile and purely bending loads. Results, presented in dimensionless form, useful for determining fatigue lives of bolts and pins.

B86-10163

THREE-AXIS LOAD-CELL ASSEMBLY

G. R. REWERTS (Ametek, Inc.)

Jun. 1986

MSC-20875

Vol. 10, No. 2, P. 111

Force-measuring device both sensitive and rugged. Load-cell assembly placed between manipulator and object being manipulated. Load cells measure forces on object almost directly, without interference by intervening manipulator forces. Developed for use with remote manipulator that bends cryogenic ducts. Device rugged and functions over wide range, having applications in automatic testing equipment, industrial robots, and force-measuring equipment.

B86-10164

ACOUSTIC/MAGNETIC STRESS SENSOR

J. S. HEYMAN, and M. NAMKUNG (College of William and Mary)

Jun. 1986

LAR-13320

Vol. 10, No. 2, P. 112

High-resolution sensor fast, portable, does not require permanent bonding to structure. Sensor measures nondestructively type (compressive or tensile) and magnitude of stresses and stress gradients present in class of materials. Includes precise

high-resolution acoustic interferometer, sending acoustic transducer, receiving acoustic transducer, electromagnet coil and core, power supply, and magnetic-field-measuring device such as Hall probe. This measurement especially important for construction and applications where steel is widely used. Sensor useful especially for nondestructive evaluation of stress in steel members because of portability, rapid testing, and nonpermanent installation.

B86-10165**MATCHING VIBRATION TESTING TO 'REAL-WORLD' CONDITIONS**

LBERT D. OLSEN, JR. (Beech Aircraft Corp.), and A. V. KEBLAITIS (Rockwell International Corp.)
Jun. 1986

MSC-20665**Vol. 10, No. 2, P. 113**

Vibration spectrum of test machine adjusted to that observed in operation. Test specimen placed in test fixture and attached to shaker. Shaker initially operated at one-quarter full level of input spectrum to prevent overloading. Short vibration test run, and specimen response compared to control spectrum. Input spectrum then adjusted until response resembles control spectrum.

B86-10166**STRESS MEASUREMENT BY GEOMETRICAL OPTICS**

R. S. ROBINSON (Colorado State University), and S. M. ROSSNAGEL (Colorado State University)
Jun. 1986 See Also (N84-18322)

LEW-14169**Vol. 10, No. 2, P. 114**

Fast, simple technique measures stresses in thin films. Sample disk bowed by stress into approximately spherical shape. Reflected image of disk magnified by amount related to curvature and, therefore, stress. Method requires sample substrate, such as cheap microscope cover slide, two mirrors, laser light beam, and screen.

B86-10167**VARIABLE CONTROL PORT FOR FLUIDIC CONTROL DEVICE**

EARL R. COLLINS, JR. (Caltech)
Jun. 1986

NPO-16603**Vol. 10, No. 2, P. 114**

Volume and velocity of control flow independently adjustable. In proposed device rotatable D-shaped control sector throttles down control port or open it completely and set to any intermediate control-port crosssectional area. Although adjustment affects volume and control-port head loss, volume and velocity controlled independently by also adjusting fluidsupply pressure. Allows adjustment to wider range of control conditions and ability to maximize control efficiency. Fluidic control theory suggests possibility of improvement in control ratio of at least 2:1 over conventional devices.

B86-10168**MEASURING WATER-LAYER THICKNESS**

N. FAULCON
Jun. 1986

LAR-13347**Vol. 10, No. 2, P. 115**

Technique uses optical proximity detector. Detector consists of sensing probe, cartridge containing photocell and light source, and electronics package, housed in metal carrying case. Light transmitted from fiber-optic probe reflected by observed surface and transmitted back through probe to photoreceiver, output of which indicated on digital voltmeter or other suitable instrument. Sensor used to detect presence of bubbles or particles in water stream or to trigger alarm when condensing water becomes present in bottom of supposedly dry tank. Fiber-optic probes of sizes up to 0.285 in. (7.24 mm) with varying sensitivities and configurations available for use with system.

B86-10169**DYNAMIC PRESSURE CALIBRATION STANDARD**

P. C. SCHUTTE, K. H. CATE, and S. D. YOUNG (West Virginia Institute of Technology)
Jun. 1986

LAR-13443**Vol. 10, No. 2, P. 116**

Vibrating columns of fluid used to calibrate transducers. Dynamic pressure calibration standard developed for calibrating flush diaphragm-mounted pressure transducers. Pressures up to 20 kPa (3 psi) accurately generated over frequency range of 50 to 1,800 Hz. System includes two conically shaped aluminum columns one 5 cm (2 in.) high for low pressures and another 11 cm (4.3 in.) high for higher pressures, each filled with viscous fluid. Each column mounted on armature of vibration exciter, which imparts sinusoidally varying acceleration to fluid column. Signal noise low, and waveform highly dependent on quality of drive signal in vibration exciter.

B86-10170**MIXER ANALYSIS OF NACELLE/NOZZLE FLOW**

T. J. BARBER (United Technologies Corp.), and R. AMIET
Jun. 1986

LEW-14073**Vol. 10, No. 2, P. 117**

Flow over idealized nozzle computed. Analysis and computer program calculate flow over idealized mixer nozzle. Nozzle idealized by unwrapping it so planform lies in $z=0$ plane. Linearized compressible flow used to calculate flow and mixer shape given loading on mixer. End goal to achieve maximum amount of mixing downstream of mixer while retaining reasonable shape for mixer. Because analysis assumes linearized flow, calculation of effects of deep lobe penetration cannot be made using this program.

B86-10235**PREDICTING AIRCRAFT SPRAY PATTERNS ON CROPS**

M. E. TESKE (Continuum Dynamics, Inc.), and A. J. BILANIN (Continuum Dynamics, Inc.)
May 1986

LAR-13432**Vol. 10, No. 3, P. 78**

Agricultural Dispersion Prediction (AGDISP) system developed to predict deposition of agricultural material released from rotary- and fixed-wing aircraft. AGDISP computes ensemble average mean motion resulting from turbulent fluid fluctuations. Used to examine ways of making dispersal process more efficient by insuring uniformity, reducing waste, and saving money. Programs in AGDISP system written in FORTRAN IV for interactive execution.

B86-10236**ESTIMATING AVERAGE WIND VELOCITY ALONG A TRAJECTORY**

P. BERTSCH (McDonnell Douglas Corp.)
May 1986

MSC-20792**Vol. 10, No. 3, P. 78**

Average Wind Velocity (VWAVE) program calculates average wind velocity over time for particular vehicle trajectory. Calculation based on wind profile, which is wind magnitude at various altitudes. Average of wind profile over altitude does not correlate well with actual apparent effect of wind. Wind profiles with low average velocities more severe than some wind profiles with high average velocities. VWAVE written in FORTRAN V for interactive execution.

B86-10237**RESEARCH PROGRAM FOR VIBRATION CONTROL IN STRUCTURES**

D. L. MINGORI (H.R. Textron, Inc.), and J. S. GIBSON (H. R. Textron, Inc.)
May 1986

NPO-16615**Vol. 10, No. 3, P. 80**

Purpose of program to apply control theory to large space structures (LSS's) and design practical compensator for

suppressing vibration. Program models LSS as distributed system. Control theory applied to produce compensator described by functional gains and transfer functions. Used for comparison of robustness of low- and high-order compensators that control surface vibrations of realistic wrap-rib antenna. Program written in FORTRAN for batch execution.

B86-10238**FLUTTER AND VIBRATION ANIMATION PROGRAM**

R. L. TISCHNER (Rockwell International Corp.)

May 1986

MSC-20895

Vol. 10, No. 3, P. 80

Flutter and Vibration Animation (FLUVIAN) program produces animated picture of structure as it vibrates at constant amplitude. Permits visual observation of fluttering motion of components as they oscillate in combination of modes. Animated display provides insight into local deflection patterns induced in structure, overlooked if modal deflection patterns were separately examined and combined mentally. FLUVIAN program written in FORTRAN 77 for interactive execution.

B86-10239**COMBINING STRUCTURAL AND SUBSTRUCTURAL MATHEMATICAL MODELS**

V. K. CHOA (Rockwell International Corp.)

May 1986

MSC-20897

Vol. 10, No. 3, P. 80

Automation reduces input length and potential data-entry errors. Matrix Automated Reduction and Coupling (MARC) program used for combining NASTRAN substructural models with primary structural model MARC also constructs job-control language (JCL) stream for NASTRAN batch job that utilizes previously-written user library of dynamic models. Minimizes lengthy input and reduces potential data-entry errors. MARC procedure used in assembling Space Shuttle orbiter dynamic models since 1983 and reduced NASTRAN modeling input time by as much as 50 percent. MARC program written in FORTRAN IV for interactive execution.

B86-10240**ANALYZING SHUTTLE ORBITER TRAJECTORIES**

W. M. LEAR (TRW, Inc)

May 1986

MSC-20786

Vol. 10, No. 3, P. 80

LRBET4 program best-estimated-of-trajectory (BET) calculation for post-flight trajectory analysis of Shuttle orbiter. Produces estimated measurements for comparing predicted and actual trajectory of Earth-orbiting spacecraft. Kalman filter and smoothing filter applied to input data to estimate state vector, reduce noise, and produce BET. LRBET4 written in FORTRAN IV for batch execution.

B86-10241**PREDICTING FAILURES OF COMPOSITE, SPHERICAL PRESSURE VESSELS**

J. D. DOZIER

May 1986

MFS-27050

Vol. 10, No. 3, P. 82

Long-term viscoelastic effects computed to predict bursts. Spherical pressure vessels commonly made of filamentary composites for applications they must light in weight. Program developed for predicting failure of such vessel over long time span. Short-term failure pressures (bursting points) predicted, but long-term structural integrity of laminated vessels studied only now.

B86-10253**VARIABLE-FRICTION SECONDARY FACE SEALS**

E. DIRUSSO

May 1986

LEW-14170

Vol. 10, No. 3, P. 92

Feedback-controlled friction or damping suppresses vibrations. Variable-friction secondary seal conceived to control vibration and stability of primary seal ring over wide range of conditions. By varying friction force or damping applied to primary seal ring, vibration controlled to provide stable operation. Advantages of 'variablefriction secondary seal': face-seal stability controlled as function of primary-ring vibration amplitudes, and also friction remotely changed to achieve acceptable vibration amplitudes for large range of seal-operating conditions without compromising secondary-seal performance. Concept also useful in seal testing in which dynamic stability of face seals is under evaluation.

B86-10254**MEASURING THICKNESSES OF COATINGS ON METALS**

GLENN M. COTTY, JR. (Martin Marietta Corp.)

May 1986

MFS-28126

Vol. 10, No. 3, P. 94

Digital light sensor and eddy-current sensor measure thickness without contact. Surface of Coating reflects laser beam to optical sensor. Position of reflected spot on sensor used by microcomputer to calculate coating thickness. Eddy-current sensor maintains constant distance between optical sensor and metal substrate. When capabilities of available components fully exploited, instrument measures coatings from 0.001 to 6 in. (0.0025 to 15 cm) thick with accuracy of 1 part in 4,000. Instrument readily incorporated in automatic production and inspection systems. Used to inspect thermal-insulation layers, paint, and protective coatings. Also used to control application of coatings to preset thicknesses.

B86-10255**EQUATIONS FOR ANNULAR-HEAT-TRANSFER COEFFICIENTS**

B. YAO (Rockwell International Corp.)

May 1986

MFS-29074

Vol. 10, No. 3, P. 96

Tables of coefficients converted to algebraic expressions. Plot of Equation for Nusselt number agrees closely with points from tabulated data. Equation for Nusselt number and those for coefficients A and B obtained by regression analysis of data. Other plots also show close agreement for radius of 0.1 and 0.2. In equation form, coefficients incorporated into mathematical models more readily than as tabular data. Equations simplify design and analysis of heat exchangers.

B86-10256**CONTINUOUS, MULTIELEMENT, HOT-FILM TRANSITION GAGE**

B. HOLMES, J. MCPHERSON, F. HARRIS, J. DIAMOND, N. JOHNSON, and J. CHAPMAN (Kentron International, Inc.)

May 1986

LAR-13319

Vol. 10, No. 3, P. 97

Accurate measurement of location where laminar boundary layer undergoes transition to turbulent one serves many purposes in basic aero-dynamic research and developmental testing. Individual gages must be staggered to prevent formation of turbulence at gages downstream. This arrangement precludes accurate measurements of laminar/turbulent transition regions along streamline. Complete understanding of performance, stability, and control of laminar-flow airplane requires knowledge of transition locations on wing surface, empennage surfaces, fuselage, and nacelles. Visual, acoustic, and electronic methods capable of providing this transition information.

B86-10257**TWO-AXIS, SELF-NULLING SKIN-FRICTION BALANCE**

P. TCHENG, and FRANK H. SUPPLEE, JR.

May 1986

LAR-13294**Vol. 10, No. 3, P. 98**

Two-dimensional aerodynamic skin-friction force measured directly. Disk-shaped prototype design has overall dimensions of 1.25 (3.18 centimeters) diameter and 0.5 inch (1.27 centimeters) height. Unique mechanism consisting of two flexural pivoted arms connected in tandem but at right angle with each other designed to impart plane motion needed to sense two-axis flow over sensing element of balance. Sensing element, 0.370 inch (0.940 centimeter) in diameter, attached to end of second arm is servoed by two restoring-force motors orthogonally mounted in plane of airflow. Mechanism allows free plane motion of sensing element with no friction, and balance self-nulled to provide direct plane skin-friction force measurements continuously.

B86-10258**ACOUSTIC-LINER ADMITTANCE IN A DUCT**

W. R. WATSON

May 1986 See Also N84-27543/NSP

LAR-13399**Vol. 10, No. 3, P. 99**

Method calculates admittance from easily obtainable values. New method for calculating acoustic-liner admittance in rectangular duct with grazing flow based on finite-element discretization of acoustic field and reposing of unknown admittance value as linear eigenvalue problem on admittance value. Problem solved by Gaussian elimination. Unlike existing methods, present method extendable to mean flows with two-dimensional boundary layers as well. In presence of shear, results of method compared well with results of Runge-Kutta integration technique.

B86-10259**SENSING HORIZONTAL HEADING IN AIRCRAFT MANEUVERS**

K. T. COWDIN

May 1986

FRC-11043**Vol. 10, No. 3, P. 100**

Modified gyroscopic system indicates geographic heading even in nearly vertical flight. Gyroscopes and gimbals of system assume this configuration when aircraft has pitched into vertical dive. Outer roll gimbal fixed with respect to aircraft frame in this orientation. Now, azimuth signal in modified system indicates what aircraft heading would be if it were to resume level flight from climb or dive.

B86-10260**MEASURING ACOUSTIC-RADIATION STRESSES IN MATERIALS**

JOHN H. CANTRELL, JR, and W. T. YOST

May 1986

LAR-13440**Vol. 10, No. 3, P. 101**

System measures nonlinearity parameters of materials. Uses static strain generated by acoustic wave propagating in material. Since static strain is effectively 'dc' component of waveform distortion, problems associated with phase-cancellation artifacts disappear. Further, sign of nonlinearity parameter obtained by simple inspection of measured signal polarity. These features make this system very amenable to use in field. System expected to become standard for acoustic-radiation-stress measurements for solids and liquids and for characterization of material properties related to strength and residual or applied stresses. Also expected to become standard for transducer calibration.

B86-10261**SPRING-LOADED JOULE-THOMSON VALVE**

J. A. JONES (Caltech), and M. J. BRITCLIFFE (Caltech)

May 1986

NPO-16546**Vol. 10, No. 3, P. 101**

Improved design reduces clogging and maintains constant pressure drop as flow rate varies. Spring-Loaded Joule-Thomson

Valve pressure drop regulated by spring pushing stainless-steel ball against soft brass seat. Pressure drop remains nearly constant, regardless of helium flow rate and of any gas contaminants frozen on valve seat. Because springloaded J-T valve maintains constant pressure drop, upstream roomtemperature throttle valve adjusts flow rate precisely for any given upstream pressure. In addition, new valve relatively invulnerable to frozen gas contaminants, which clog fixed-orifice J-T valves.

B86-10262**FEEDBACK-CONTROLLED REGULATION OF GAS PRESSURE**

J. C. SMITH, and P. LEONE

May 1986

GSC-12990**Vol. 10, No. 3, P. 102**

Internal pressure maintained over wide range of external pressures and exhaust rates. Gaseous pressure in liquid-nitrogen Dewar regulated by movable tapered plug, positioned automatically in response to signals generated by piezoelectric pressure transducer. Designed specifically to maintain airborne infrared detectors at constant temperature in evaporating liquid nitrogen, system modified to regulate pressure in other enclosed systems.

B86-10263**PARALLEL-END-POINT DRAFTING COMPASS**

J. CRONANDER (Rockwell International Corp.)

May 1986

MFS-29070**Vol. 10, No. 3, P. 103**

Parallelogram linkage ensures greater accuracy in drafting and scribing. Two members of arm of compass remain parallel for all angles pair makes with hub axis. They maintain opposing ends members in parallelism. Parallelogram-linkage principle used on dividers as well as on compasses.

B86-10264**EVALUATION OF MATHEMATICAL TURBULENCE MODELS**

M. NALLASAMY

May 1986 See Also N85-25757/NSP

MFS-27118**Vol. 10, No. 3, P. 104**

Simplified models for internal flow described, and their predictions compared with experimental results. Report presents account of various models used in computation of turbulent flows. Applications of these models to internal flows evaluated by analysis of predictions of various turbulence models in some important flow configurations.

B86-10265**CORRECTING FOR SUPPORTS IN STRUCTURAL DYNAMIC TESTING**

B. K. WADA (Caltech), C. P. KUO (Caltech), and R. J. GLASER (Caltech)

May 1986

NPO-16620**Vol. 10, No. 3, P. 104**

Testing under variety of support conditions combined with computer analysis to update mathematical models to match test data. Report suggests dynamic characteristics of large space structures predicted, without full-scale testing, by method that combines experiment and analysis. Method, multiple-boundary-condition testing, developed for such large space structures as dish antennas, towers, and solar-cell arrays.

B86-10336**NONLINEAR SUPERSONIC FULL POTENTIAL ANALYSIS**

V. SHANKAR (Rockwell International Corp.), and K. SZEMA (Rockwell International Corp.)

Jul. 1986

LAR-13413**Vol. 10, No. 4, P. 72**

Supersonic Implicit Marching Program (SIMP) applies numerical

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method, based on conservative form of full potential equation, to problem of threedimensional supersonic flows with embedded subsonic regions. Conservative formulation of problem provides ability to capture shocks and to assess accurately impact of sweep, thickness, and lift for conditions where linear theory unsatisfactory. Technique uses characteristic signal-propagation theory to control density biasing for treatment of shocks (including embedded shocks) and mixed elliptic/hyperbolic crossflow. SIMP written in FORTRAN 77.

B86-10337

CALCULATING AERODYNAMIC-STABILITY DERIVATIVES

C. E. LAN (University of Kansas Center for Research, Inc.)
Jul. 1986

LAR-13471

Vol. 10, No. 4, P. 72

VORSTAB program developed to calculate lateral-directional characteristics of nonplanar wing/body combinations in subsonic flow. Mathematically determines effects of edge-separated vortex flow, including augmented vortex lift, strake-induced downwash, and vortex breakdown. VORSTAB written in FORTRAN IV.

B86-10338

WING-DESIGN PROGRAM FOR SUBSONIC OR SUPERSONIC SPEEDS

H. W. CARLSON (Kentron International, Inc.), and K. B. WALKLEY (Kentron International, Inc.)

Jul. 1986

LAR-13315

Vol. 10, No. 4, P. 72

Surface of mildest possible camber generated. WINGDES provides analysis, design capability and is applicable to both subsonic and supersonic flows. Optimization carried out for entire wing or for designated leading- and trailing-edge areas, for design of missionadaptive surfaces. WINGDES written in FORTRAN IV.

B86-10349

ULTRASONIC INSPECTION NEAR SMALL BORES

R. G. PARENT (Rockwell International Corp.)

Jul. 1986

MFS-29024

Vol. 10, No. 4, P. 80

Portable ultrasonic probe makes it possible to inspect for hidden cracks near insides of narrow tubes. Using pulse-echo technique, instrument detects cracks as small as 0.015-in. (0.38-mm) deep. Used for nondestructive inspection of other hard-to-reach places where conventional large transducers will not fit or where difficult to apply coupling liquid for contact ultrasonic testing. Inspects bore of tubelike fitting. Instrument makes it unnecessary to disassemble fitting to check for cracks. Precise orientation of transducer with respect to part not necessary for detecting cracks.

B86-10350

BETA BACKSCATTER MEASURES THE HARDNESS OF RUBBER

E. T. MORRISSEY (Rockwell International Corp.), and F. N. ROJE (Rockwell International Corp.)

Jul. 1986

MSC-20991

Vol. 10, No. 4, P. 82

Nondestructive testing method determines hardness, on Shore scale, of room-temperature-vulcanizing silicone rubber. Measures backscattered beta particles; backscattered radiation count directly proportional to Shore hardness. Test set calibrated with specimen, Shore hardness known from mechanical durometer test. Specimen of unknown hardness tested, and radiation count recorded. Count compared with known sample to find Shore hardness of unknown.

B86-10351

OMNIVECTOR PROBE MEASURES AIRFLOW

L. KRAUSE, and G. FRALICK

Jul. 1986

LEW-13830

Vol. 10, No. 4, P. 84

Problems overcome with development of new omnivector anemometer. Includes cylindrical sensing element with eight strain gages. Gages, connected in two Wheatstone bridges, sense two perpendicular components of flow across cylinder. Designed and tested, has fixed-position sensing element capable of simultaneously measuring steady and unsteady velocity head and flow direction of moving fluid over complete 360-degree angle in two-dimensional flow.

B86-10352

IMPROVED TECHNIQUE FOR FINDING VIBRATION PARAMETERS

L. V. ANDREW (Rockwell International Corp.), and C. C. PARK (Rockwell International Corp.)

Jul. 1986

MSC-20901

Vol. 10, No. 4, P. 86

Filtering and sample manipulation reduce noise effects. Analysis technique improves extraction of vibrational frequencies and damping rates from measurements of vibrations of complicated structure. Structural vibrations measured by accelerometers. Outputs digitized at frequency high enough to cover all modes of interest. Use of method on set of vibrational measurements from Space Shuttle, raised level of coherence from previous values below 50 percent to values between 90 and 99 percent

B86-10353

SYNCHRONOUSLY DEPLOYABLE TRUSS STRUCTURES

M. D. RHODES, and J. M. HEDGEPEETH (Astro Research Corp.)

Jul. 1986

LAR-13490

Vol. 10, No. 4, P. 86

Structure lightweight, readily deployed, and has reliable joints. New truss concept, designated as 'pac truss,' developed. Features easy deployment without need for complex mechanisms. Structures of this type deployed in free flight by controlled release of stored energy in torsional springs at selected hinges located throughout structure. Double-folding technique used in beam model applicable to flat planar trusses, allowing structures of large expanse to fold into compact packages and be deployed for space-platform applications.

B86-10354

DETECTING FOREIGN PARTICLES IN WIND TUNNELS

H. L. SHARP (Rockwell International Corp.), P. A. HOGENSON (Rockwell International Corp.), and W. D. EMDE (Rockwell International Corp.)

Jul. 1986

MSC-20850

Vol. 10, No. 4, P. 87

Simple scratch test tells whether particles, which distort results, present in test. Detector developed for tests of abrasion resistance of flexible insulation blankets. Now, when detector indicates particles present in test, results interpreted accordingly. Small pits and scratches on metal foil indicate particles struck surface during wind-tunnel test. Detector used in tests of paints and coatings to determine whether abrasive particles present.

B86-10355

MONITORING TEMPERATURES INDIRECTLY IN COOLED COMBUSTORS

W. WAGNER (Rockwell International Corp.)

Jul. 1986

MFS-29061

Vol. 10, No. 4, P. 88

Noninvasive monitoring of temperatures on inner surface of combustion liner of cooled combustor increases liner life, thereby increasing combustor reliability and performance. Technique used in furnaces, reactors, jet engines, rocket engines, stationary turbines, combustors, and heat exchangers. Growth of internal

overheating streaks monitored using output from array of thermocouples on outside wall of combustor. Computer analysis of output indicates temperature pattern on combustor lining. Use of data enables timely liner maintenance or overhaul.

B86-10356

MEASUREMENT OF DYNAMIC BOLT-STRESS

S. BARKHOUNDARIAN (Rockwell International Corp.)

Jul. 1986

MFS-29058

Vol. 10, No. 4, P. 89

Ultrasonic method provides record of changing stresses in dynamically loaded bolts. Makes available history of stress cycles, from which fatigue state and remaining bolt life inferred.

B86-10357

DETERMINING CHAOTIC INSTABILITIES IN MECHANICAL SYSTEMS

M. A. ZAK (Caltech)

Jul. 1986

NPO-16709

Vol. 10, No. 4, P. 89

Theoretical developments enable suppression of chaotic structural motions. Theory enables prediction, avoidance, and suppression of chaotic vibrations in structures, especially using dynamic feedback stabilization. In new formulation, motion both repeatable and predictable.

B86-10358

MULTISHAKER MODAL TESTING

ROY, CRAIG, JR. (University of Texas)

Jul. 1986 See Also N85-33544/NSP

MFS-27132

Vol. 10, No. 4, P. 90

Abstracts summarize time- and frequency-domain component-mode synthesis methods for damped systems. Abstracts of six papers on vibration analysis and summary of contributions and recommendations contained in them presented in 14-page report on multishaker modal testing.

B86-10359

FATIGUE CRITERION FOR SYSTEM DESIGN

E. V. ZERETSKY

Jul. 1986 See Also N85-27226/NSP

LEW-14344

Vol. 10, No. 4, P. 90

Report discusses principles of structural-life prediction. Generalized methodology developed for structural life prediction, design, and reliability, based upon fatigue criterion. Approach incorporates computed life of elemental stress volumes of complex machine elements to predict system life. Results of coupon fatigue testing incorporated into analysis, allowing for life prediction and component or structural renewal rates, with reasonable statistical certainty.

B86-10360

SCUFFING AND LUBRICATION OF GEARS AND BEARINGS

B. HAMROCK, and L. HOUPT

Jul. 1986 See Also N85-34408/NSP

LEW-14364

Vol. 10, No. 4, P. 91

New Reynolds equation developed for elastohydrodynamic-lubrication analysis. Method developed to study macro- and micro-EHL, without restriction on load applied to contact. Macro-EHL refers to lubricant film thickness developed in inlet zone of EHL conjunction. Powerful tool used to study scuffing. Using new approach, researchers have analyzed stress concentrations near both bump and groove in bearing surface.

B86-10455

ACOUSTIC COUPLER FOR MONITORING BEARING WEAR

W. JOLLY (Southwest Research Institute)

Sep. 1986

MFS-27077

Vol. 10, No. 5, P. 94

Concept for acoustic coupler allows sound efficiently conveyed from bearings to external sensor. Noise from bearings in bearing test machine monitored for signs of incipient failure. Straight through acoustic-coupler assembly inserted through existing ports in housing of bearing-testing machine. Threaded electrical connector at top rotated to adjust force applied to sensing element and contact bearing.

B86-10456

TESTING GIMBAL AXES BEFORE COMPLETE ASSEMBLY

W. BABIS (Hughes Aircraft Co.)

Sep. 1986

MSC-20809

Vol. 10, No. 5, P. 96

Early testing increases chances assembly will function well without expensive rework. Developed for antenna gimbals, test eliminates delay and costs ensued when fully assembled antenna fails because of excessive torque and friction in gimbal. Gimbal housing mounted above rotary table. Gimbal axis tested connected to torque transducer on table. With exception of special holder for gimbal housing, all of testing instruments commercially available items.

B86-10457

PERTURBATION METHOD FOR COMPUTATIONAL FLUID-DYNAMICAL EQUATIONS

L. J. CHOW, T. H. PULLIAM, and J. L. STEGER (Stanford University)

Sep. 1986

ARC-11550

Vol. 10, No. 5, P. 98

Perturbation technique yields accurate flow solutions using as few as one-fourth number of grid points required by finite-difference methods. Technique originally developed to solve Euler equations of two-dimensional, steady, inviscid transonic flow about airfoils, applicable to arbitrary equation sets and higher dimensions. New perturbations scheme used in design cycle where potential solutions generated routinely; Euler perturbation method used in second-cut analysis. Method also used to couple other equation sets.

B86-10458

CAPACITIVE GAUGE MEASURES FILM THICKNESS

H. L. SEEGRILLER

Sep. 1986

ARC-11449

Vol. 10, No. 5, P. 103

Rugged capacitive transducer measures thickness of film of liquid flowing over wind-tunnel model or other object. Transducer mounted flush with surface of model to preserve model outline, thus minimally disturbing wind-tunnel and film flows. Additional uses include thickness control of paint or nonmetallic solid films.

B86-10459

STUDYING TRANSONIC GASES WITH A HYDRAULIC ANALOG

W. WAGNER (Rockwell International Corp.), and F. LEPORE (Rockwell International Corp.)

Sep. 1986

MFS-29100

Vol. 10, No. 5, P. 104

Water table for hydraulic-flow research yields valuable information about gas flow at transonic speeds. Used to study fuel and oxidizer flow in high-pressure rocket engines. Method applied to gas flows in such equipment as furnaces, nozzles, and chemical lasers. Especially suitable when wall contours nonuniform, discontinuous, or unusually shaped. Wall shapes changed quickly for study and evaluated on spot. Method used instead of computer

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simulation when computer models unavailable, inaccurate, or costly to run.

B86-10460

SEALING A LOOSELY FITTING VALVE ASSEMBLY

L. GOFF (Rockwell International Corp.), and G. TELLIER (Rockwell International Corp.)

Sep. 1986

MFS-29051

Vol. 10, No. 5, P. 105

Double-ring seal avoids expense of remachining or redesigning valve parts. Mating fittings on valve sealed by pair of rings - one O-ring and backup ring. Backup ring fills relatively large gap between parts. Prevents softer O-ring from being pushed into and through gap.

B86-10504

MEASURING HOLE ELONGATION IN BOLTED JOINTS

G. R. WICHOREK

Nov. 1986

LAR-13453

Vol. 10, No. 6, P. 62

Measurement does not affect joint parameters. Verification of analytical and strength-prediction methods for bolted composite joints based generally on data obtained experimentally from double-lap-joint specimens. In mechanically fastened joints, stresses maximal at fastener holes. Ability to measure accurately hole elongations without affecting joint parameters provides better understanding of elastic and plastic behavior of joint material leading to failure mechanisms in mechanically fastened joints required for design of more-efficient, lightweight composite joints.

B86-10505

REDUNDANT PYROTECHNIC/MANUAL RELEASE MECHANISM

G. M. KYRIAS (Martin Marietta Corp.)

Nov. 1986

MFS-28096

Vol. 10, No. 6, P. 63

Release mechanism designed operable by remote control even if many of its components fail. In event it becomes inoperable, still actuated manually.

B86-10506

ONE-PIECE FORCE-TRANSDUCER BODY

R. A. MEYER (MTS Systems Corp.)

Nov. 1986

MFS-28140

Vol. 10, No. 6, P. 64

Rugged unit designed to operate in severe environment. Force transducer body designed for measurement of loads on specimens tested in hydrogen gas at temperatures up to 2,000 degree F (1,090 degree C). Body has symmetrical radial-shear-beam configuration and machined in one piece from bar stock.

B86-10507

SHAPE DETERMINATION FOR LARGE STATIC STRUCTURES

G. RODRIGUEZ (Caltech), and ROBERT E. SCHEID, JR. (Caltech)

Nov. 1986

NPO-16781

Vol. 10, No. 6, P. 71

Parameter and shape estimates updated from new measurements. Involves statistical structural analysis, statistical electromagnetic field analysis, filtering, measurement modeling, and iterative prediction/correction procedures. Estimating algorithms result from generalizations of Kalman statistical-filter theory.

B86-10508

MEASURING ATMOSPHERIC TURBULENCE WITH LIDAR

W. FROST (FWG Associates, Inc.), and H. KUANG (FWG Associates, Inc.)

Nov. 1986 See also N84-17574/NSP

MFS-27058

Vol. 10, No. 6, P. 73

Laser Doppler measurements promise reliably accurate indications of wind speed and turbulence. Report compares two kinds of measurements of wind and turbulence: from instruments aboard aircraft and from ground-based Doppler measurements by laser ranging equipment (lidar).

B86-10529

AERODYNAMIC PREDICTION FOR SUPERSONIC CANARD-TAIL MISSILES

M. F. DILLENIUS (Nielsen Engineering and Research, Inc.)

Nov. 1986

LAR-13527

Special Edition, P. 39

LRCDM2 computer program developed to calculate pressure distribution at points on surfaces of complete supersonic missile. Missile comprises up to two finned sections attached to axisymmetric body of circular cross section. Includes effects of vortex shedding due to forebody and forward fins, providing more accurate rolling moments. LRCDM2 written in FORTRAN IV.

B86-10530

ORBITAL-LIFETIME PROGRAM

L. H. ORR

Nov. 1986

LAR-13557

Special Edition, P. 39

Orbital Lifetime Program (OL) analyzes long-term motion of Earth-orbiting spacecraft at altitudes of up to 2,500 km. Models perturbations to orbit caused by solar-radiation pressure, atmospheric drag, and gravitational effects of Sun, Moon, and oblate Earth. Used to predict orbital lifetime and decay rate of satellites. OL written in FORTRAN 77.

B87-10023

EDDY-CURRENT DETECTION OF WEAK BOLT HEADS

C. P. MESSINA (Rockwell International Corp.)

Jan. 1987

MFS-29092

Vol. 11, No. 1, P. 48

Electronic test identifies flawed units passing hardness tests. Eddy-current test detects weakness in head-to-shank junctions of 1/4-28 cup-washer lock bolts. Developed for alloy A286 steel bolts in Space Shuttle main engine fuel turbo-pump. Test examines full volume of head, including head-to-shank transition and nondestructively screens out potentially defective units. Test adapts to any other alloys.

B87-10024

EDDY-CURRENT DETECTION OF CRACKS IN TUBES

R. PARENT (Rockwell International Corp.), and D. KETTERING (Rockwell International Corp.)

Jan. 1987

MFS-29081

Vol. 11, No. 1, P. 48

Nondestructive device tests narrow, sharply-bent metal tubes. Eddy-current probe detects incipient cracks inside small metal tubes. Tube-centering device consisting of pair of opposed bars ensures tube centered on eddy-current coil. Probe moves along length of bent tube to inspect repeatably for cracks. Compatible with tubes of different cross sections, oval, flattened, square, rectangular, or irregular. Adapts for inspecting formed tubes in petrochemical, automotive, nuclear, and medical equipment.

B87-10025

DEPTH GAUGE FOR LIQUIDS UNDER HIGH PRESSURE

A. J. ZUCKERWAR, and D. S. MAZEL (Old Dominion University)

Jan. 1987

LAR-13300**Vol. 11, No. 1, P. 55**

Piezoelectric element mounted in hole drilled in high-pressure plug. Transducer used to measure depth of liquid when pressure in vessel high. New configuration transmits ultrasonic vibration directly into liquid, enhancing signal strength, accuracy, and range, yet piezoelectric element protected from high-pressure liquid.

B87-10026**MEASURING FLUID VELOCITIES WITH GLOWING PARTICLES**

M. GHARIB (Caltech), M. A. HERNAN (Caltech), A. H. YAVROUIAN (Caltech), and V. SAROHIA (Caltech)

Jan. 1987

NPO-16653**Vol. 11, No. 1, P. 56**

Particle trajectories recorded photographically. Directions and magnitudes of velocities in unsteady liquid flow measured with aid of fluorescent- and phosphorescent-tracing technique. Method accurate and proceeds automatically, requiring minimal labor.

B87-10027**TAKING IMPRESSIONS OF HIDDEN CAVITY WALLS**

D. BURLEY (Rockwell International Corp.), and W. MAYER (Rockwell International Corp.)

Jan. 1987

MFS-29135**Vol. 11, No. 1, P. 57**

Lightweight, portable internal-molding device makes it possible to measure radii of, or examine contours of, passageways in hidden or complicated cavities. With device, measurements made in field, without returning assemblies to shop or laboratory for inspection. Molding head expands when compressed air applied. Inflatable tubes around head perform dual sealing and aligning function.

B87-10028**ENERGY-ABSORBING PASSENGER SEAT FOR AIRCRAFT**

C. P. EICHELBERGER, E. ALFARO-BOU, and E. L. FASANELLA (Kentron International, Inc.)

Jan. 1987

LAR-13385**Vol. 11, No. 1, P. 57**

Development of energy-absorbing passenger seat, designed to minimize injury in commercial-aircraft crash, part of joint FAA/NASA controlled impact flight test of transport-category commercial aircraft. Modified seat mechanism collapses under heavy load to absorb impact energy and thereby protect passenger. Results of simulation tests indicate probability of passenger survival high. Proposed seat mechanism mitigates passenger injuries by reducing impact forces in crash.

B87-10029**IMPROVED HEAT-TRANSFER CALCULATIONS FOR HYPERSONIC FLOW**

S. N. GREENSCHLAG (Rockwell International Corp.)

Jan. 1987

MSC-20756**Vol. 11, No. 1, P. 58**

Lewis number corrected for extremely high airspeeds. Algorithm calculates improved, variable value of Lewis number, factor in equation for heat-transfer coefficient at stagnation point of body in hypersonic flow mach numbers of approximately 25. New algorithm improves accuracy of calculations of heat generated by hot air acting on moving body.

B87-10030**ENVIRONMENTAL TESTING OF GLASS-FIBER/EPOXY PRESSURE VESSELS**

J. R. FADDOUL

Jan. 1987 See Also N85-30034/NSP, N81-25492/NSP

LEW-14371**Vol. 11, No. 1, P. 59**

Pair of reports discusses long-term environmental tests of glassfiber/epoxy composite pressure vessels. Strength diminishes

during long exposure to environment. Since such data necessary for accurate design of long-life structures such as pressure vessels, NASA Lewis Research Center built outdoor test stand in 1973. Test stand maintains system under constant pressure loading without frequent intervention of personnel.

B87-10031**A MODAL-PARAMETER EXTRACTION PROCEDURE**

A. H. KURDILA (University of Texas at Austin), and ROY R. CRAIG, JR. (University of Texas at Austin)

Jan. 1987 See Also N85-33747/NSP

MFS-27139**Vol. 11, No. 1, P. 60**

Procedure accommodates multiple input excitations. Improved modalparameter extraction procedure applicable to linear, time-invariant systems derived in 92-page report. Algorithm allows multiple noncoherent input excitations applied to structure and generates consistent set of modal parameters. Procedure extension of simultaneous frequency-domain (SFD) techniques achieved through investigation of two automatic methods for reducing effective problem size while minimizing amount of user interaction. In several sample runs, independent-coordinate reduction method shown more accurate method for small sample size. Principle-component method used to estimate number of modes active in given frequency range.

B87-10032**MULTIPLE-SCALE TURBULENCE MODEL**

C. CHEN

Jan. 1987 See Also N86-12551/NSP

MFS-27141**Vol. 11, No. 1, P. 61**

Turbulence in complex, recirculating flows not in spectral equilibrium. Report discusses mathematical fluid-flow model that includes multiple turbulence scales. Model developed for numerical prediction of confined, recirculating flows. Based on multiple-timescale concepts introduced in previous study, model takes into account turbulence in recirculating flow not in spectral equilibrium and different energy-transfer rates for eddies of different spatial scales treated separately.

B87-10033**IDENTIFYING VIBRATION PARAMETERS IN LARGE STRUCTURES**

D. S. BAYARD (Caltech), F. Y. HADAEH (Caltech), and C. H. C. IH (Caltech)

Jan. 1987

NPO-16770**Vol. 11, No. 1, P. 61**

Analytical method separately examines low-frequency and high-frequency behavior. Report discusses techniques for identifying rigid-body parameters, flexible-body parameters, and quasi-static disturbances in large structures. Techniques developed to aid in planning space station. Though effort directed towards space station dynamic model and environment, proposed methodology for systems identification is generic enough to allow application to arbitrarily large space structures and spacecraft configurations.

B87-10077**CALCULATING SONIC-BOOM PROPAGATION**

C. M. DARDEN, and L. TING (New York University)

Feb. 1987

LAR-13473**Vol. 11, No. 2, P. 58**

Nonlinear effects included, enabling more-realistic modeling. Modified Method of Characteristics Sonic Boom Extrapolation Program (MMOC) is computer program for sonic-boom propagation that includes shock coalescence and incorporates effects of asymmetries due to volume and lift. Numerically integrates nonlinear governing equations using data on initial data line approximately one body length from aircraft and yields sonic-boom

pressure at ground as function of time or of position at given time. MMOC written in FORTRAN IV.

B87-10078
PREDICTING SPACECRAFT TRAJECTORIES

J. KWOK (Caltech)

Feb. 1987

NPO-16731

Vol. 11, No. 2, P. 58

Calculations include drag, nonsphericity, and other perturbations. Artificial Satellite Analysis Program (ASAP) is general orbit-prediction program that incorporates sufficient orbit-modeling accuracy for mission design, maneuver analysis, and mission planning. Suitable for studying planetary orbit missions with spacecraft trajectories of exploratory (mapping) nature. Sample data included for study of drift cycle of geosynchronous station, strategy for mapping Venus by radar, frozen orbit about Mars, and repeat-ground-trace orbit. ASAP written in FORTRAN 77.

B87-10080
PORTABLE, CONTROLLED-LOAD-RATE TENSION TESTER

R. S. JAMIESON (Martin Marietta Corp.)

Feb. 1987

MFS-28075

Vol. 11, No. 2, P. 60

Tensile-testing machine for ceramic and foam materials has self-contained air supply with built-in airflow controller. New machine easily moved to point of use, and loads applied automatically at constant rate of increase, without fluctuations caused by manual control of supply pressure. Eliminates impact after failure of specimen so it does not damage itself. Potential applications of machine include tensile tests of large composite parts that contain localized defects and adhesion tests of virtually any bonded structure.

B87-10081
ACTIVE-CONTROL BEARINGS FOR ROTOR SHAFTS

K. NONAMI

Feb. 1987 See Also N85-29292/NSP

LEW-14319

Vol. 11, No. 2, P. 61

Vibrations suppressed by feedback control. Flexural forced vibrations or self-excited vibrations of rotating system suppressed by active elements. Instead of dissipating vibration forces through damped supports, active elements apply forces, through bearing housing, that cancel vibration displacements. Bearing systems incorporating such devices appropriately named active-control bearings. Active-control bearing systems effective not only for imbalance forces but also for unstable or external forces transmitted from foundation. Damping ratios of system easily changed by modifying state-feedback control system.

B87-10082
NONCONTACTING MEASUREMENT OF SHAFT ANGLE

S. BARKHOUDARIAN (Rockwell International Corp.)

Feb. 1987

MFS-19810

Vol. 11, No. 2, P. 63

Fiber-optic transducer offers several advantages over mechanical linkages. Angular position of rotary valve measured by pair of optical-fiber deflectometers. Measurement device sensitive, immune to electromagnetic interference, and does not wear out since fibers do not make contact with valve. Device more rugged than linear or rotary variable-differential transformers it replaces.

B87-10083
MEASURING LEAKAGE FROM LARGE, COMPLICATED MACHINERY

S. BOTTEMILLER (Rockwell International Corp.)

Feb. 1987

MFS-19945

Vol. 11, No. 2, P. 63

Test chamber improvised from large bag. Cumulative sizes of leaks in large, complicated machinery measure with relatively simple variation of helium leak-checking technique. When used to check Space Shuttle main engine, new technique gave repeatable and correct results within 0.5 stdin./min (1.4×10^{-6} negative to the seventh power stdm³/s).

B87-10084
REDUCING FATIGUE IN A ROTARY FLOWMETER

G. RAO (Rockwell International Corp.)

Feb. 1987

MFS-29038

Vol. 11, No. 2, P. 64

Redesign of vanes straightening flow of liquid in rotary flowmeter increase fatigue lives of vanes and rotor. Purpose of vanes to eliminate turbulence so proportionality between flow and rotor speed constant. Nonuniform but symmetrical, new spacing of straightener vanes prevents flow wake from strongly interacting with rotor blades. At same time, vanes ensure accurate flow-rate measurement.

B87-10085
ON-ORBIT SYSTEM IDENTIFICATION

E. METTLER (Caltech), M. H. MILMAN (Caltech), D. BAYARD (Caltech), and D. B. ELDRED (Caltech)

Feb. 1987

NPO-16588

Vol. 11, No. 2, P. 64

Information derived from accelerometer readings benefits important engineering and control functions. Report discusses methodology for detection, identification, and analysis of motions within space station. Techniques of vibration and rotation analyses, control theory, statistics, filter theory, and transform methods integrated to form system for generating models and model parameters that characterize total motion of complicated space station, with respect to both control-induced and random mechanical disturbances.

B87-10086
DEPLOYABLE BRAKE FOR SPACECRAFT

J. R. RAUSCH (General Dynamics Corp.), and J. W. MALONEY (General Dynamics Corp.)

Feb. 1987

MFS-25702 MFS-25722

Vol. 11, No. 2, P. 65

Aerodynamic shield that could be opened and closed proposed. Report presents concepts for deployable aerodynamic brake. Brake used by spacecraft returning from high orbit to low orbit around Earth. Spacecraft makes grazing passes through atmosphere to slow down by drag of brake. Brake flexible shield made of woven metal or ceramic withstanding high temperatures created by air friction. Stored until needed, then deployed by set of struts.

B87-10127
THERMAL-ANALYSIS PROGRAM

D. I. LEVINE (Rockwell International Corp.)

Mar. 1987

MSC-21140

Vol. 11, No. 3, P. 42

Temperature changes with time modeled with traditional electrical analog. General Thermal Analyzer program solves transient and steady-state thermal problems using desk-top computers. Program written in BASIC.

B87-10128
BUCKLING ANALYSIS OF RECTANGULAR PLATES WITH HOLES

M. P. NEMETH

Mar. 1987

LAR-13466

Vol. 11, No. 3, P. 42

BUCKO is computer program developed to predict buckling of

rectangular compression-loaded orthotropic plate with centrally located cutout. Plate assumed balanced, symmetric laminate of uniform thickness. Cutout shape elliptical, circular, rectangular, or square. Package includes sample data demonstrating essence of program and ease of use. Written in FORTRAN V.

B87-10131**QUICK-RELEASE PANEL FASTENER**

D. R. FOSDICK (Rockwell International Corp.), and R. C. PHILLIPS (Rockwell International Corp.)

Mar. 1987

MSC-20767

Vol. 11, No. 3, P. 44

Quick-release fastener for panels actuated with just one hand. Fastener has no loose parts, does not require mating hardware, and used in blind hole in mating panel. New panel fastener self-contained unit extending through congruent holes in two panels to be joined. Unit contracts to clamp panels together and expands to release them.

B87-10132**DUPLEX WRENCH**

C. N. CANADA (Rockwell International Corp.)

Mar. 1987

MSC-20585

Vol. 11, No. 3, P. 46

Special tool enables one worker to do two-worker job. Wrench holds two nuts in place while third nut, coaxial with others, turned. Developed for tightening delicate couplings on gas-supply panel. Single operator restrains coupling pressure cap and connector body nut with one hand. Other hand free to tighten coupling nut with torque wrench.

B87-10133**SIDE-LOOKING VIEWER FOR CREVICES**

G. R. HAGEN (Rockwell International Corp.)

Mar. 1987

MSC-20610

Vol. 11, No. 3, P. 46

Side-looking optical viewer inserted into gap 1 mm wide to depth of 10 cm. Instrument allows human observer to inspect small crevices from comfortable viewing angle. Small mirror atop pair of thin, flat legs inserted into gap. Mirror reflects image of gap wall or other object into microscope, which magnifies image 20 times. Quartz/halogen lamp in separate unit provides light to illuminate gap via optical-fiber bundle. Observer looks directly through microscope or attaches photographic or video camera without disturbing setup.

B87-10134**MEASURING POISSON RATIOS AT LOW TEMPERATURES**

R. S. BOOZON (Martin Marietta Corp.), and J. A. SHEPIC (Martin Marietta Corp.)

Mar. 1987

MFS-28107

Vol. 11, No. 3, P. 47

Simple extensometer ring measures bulges of specimens in compression. New method of measuring Poisson's ratio used on brittle ceramic materials at cryogenic temperatures. Extensometer ring encircles cylindrical specimen. Four strain gauges connected in fully active Wheatstone bridge self-temperature-compensating. Used at temperatures as low as liquid helium.

B87-10135**SERVICE-LIFE EXTENSION OF EXPLOSIVE ESCAPE DEVICES**

L. J. BEMENT, and M. L. SCHIMMEL (McDonnell Aircraft Co.)

Mar. 1987 See Also N85-22381/NSP

LAR-13462

Vol. 11, No. 3, P. 48

Chemical and functional tests yield conservative service-life estimates. Approach to extension of service lives of explosive devices in aircraft escape system developed, supported by testing

of representative candidate devices to evaluate quantitatively effects of service, age, and degradation, and to enable responsible, conservative service-life determinations. Five types of explosive components evaluated: rigid and flexible explosive transfer lines; one-way transfers; flexible, linear-shaped charges; and initiation-handles. Extension of service in realistic manner provides both cost savings and increased system reliability.

B87-10136**SPECIMEN AND HOLDER FOR SLIDING-MODE FATIGUE TESTS**

R. J. BUZZARD, G. SUCCOP, and B. GROSS

Mar. 1987 See Also N84-29248/NSP and N85-16205/NSP

LEW-14281

Vol. 11, No. 3, P. 55

Single-ended notch design facilitates accurate measurements of crack progression. Novel test specimen and novel loading fixture and fracture testing of materials under Mode II, or sliding-mode, loading. Testing required for analysis of failures in structural materials, bearings, and the like.

B87-10137**HIGH-PRESSURE VALVE WITH CONTROLLED SEATING FORCE**

R. H. BRADLEY

Mar. 1987

MSC-20932

Vol. 11, No. 3, P. 56

Poppet and seat less likely to be damaged by faulty operation. Improvements in widely-used high-pressure valve increase accuracy of preloading of poppet. Redesigned valve prevents metal shavings and other debris from developing during operation, installation, or removal. New features include secondary seal in cap. Belleville washers create precise value of seating force. If installer attempts to exceed force, torque limiter gives tactile and aural warning and makes further force increases difficult.

B87-10138**LOCATING SONIC LINES IN TRANSONIC NOZZLES**

W. R. WAGNER (Rockwell International Corp.), F. F. LEPORE (Rockwell International Corp.), and B. J. OSTERMIER (Rockwell International Corp.)

Mar. 1987

MFS-29163

Vol. 11, No. 3, P. 57

New set of formulas for positions of sonic lines enables more accurate determination of pressures, heat transfers, and flow-discharge coefficients in advanced convergent/divergent nozzles. Older, closed-form approximate solutions of Sauer type used to determine best position. In advanced nozzles with shorter transonic fields, such approximations no longer adequate.

B87-10139**LARGE WIRE STRAIN GAUGES**

B. D. BRYNER (Thiokol Chemical Corp.)

Mar. 1987

MFS-28062

Vol. 11, No. 3, P. 58

Wires yield data on average strains over distances ranging from inches to many feet. Long constantan wires used to measure average strains over distances characteristic of vehicles or buildings. Connected in bridge circuit, wires measure strain accurately within 1 percent, and linearly, within 0.1 percent. Wires stretch as much as 0.15 percent and still return to zero residual strain after release.

B87-10140**DESIGN IMPROVEMENT FOR AIRPLANE-ENGINE NACELLES**

D. F. VERNON (McDonnell Douglas Corp.), G. S. PAGE (McDonnell Douglas Corp.), and H. R. WELGE (McDonnell Douglas Corp.)

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ARC-11580

Vol. 11, No. 3, P. 59

Advanced three-dimensional transonic design routine for wingmounted engine nacelles modified to include effects of propellers and wing sweep. Resulting new nacelle shapes introduce less airflow disturbance and less drag. Improvement consists of introduction of boundary conditions in form of nonuniform onset flow in area of wing washed by propeller slipstream. Routine generates nacelle shape as series of cross sections swept, relatively to unperturbed flow, as function of wing shape.

B87-10141

PREDICTING CLOSE SATELLITE ENCOUNTERS

B. R. MCCORMICK (McDonnell Douglas Corp.), J. D. VEDDER (McDonnell Douglas Corp.), J. W. COMPTON (McDonnell Douglas Corp.), and G. N. HIRSCH (McDonnell Douglas Corp.)

Mar. 1987

MSC-21102

Vol. 11, No. 3, P. 60

Method for predicting probabilities of collisions between nominally geosynchronous satellites gives results without large computer resources. Realistically assesses possibility of collision between expired, drifting satellite and active, station-keeping satellite. Mathematical techniques in paper useful in analysis of such terrestrial risks as floods and nuclear accidents.

B87-10142

STATION-KEEPING MANEUVERS FOR GEOSYNCHRONOUS SPACECRAFT

J. A. KECHICHIAN (Caltech)

Mar. 1987

NPO-16512

Vol. 11, No. 3, P. 60

New strategy saves fuel. Report discusses three existing strategies for maneuvers that maintain apparent position of geosynchronous satellite and present new strategy for satellite subject to daily momentum-wheel dumps. Increases useful lifetime of satellite by reducing frequencies and sizes of maneuvers, reducing rate of fuel consumption.

B87-10190

PROTECTING A BALL-BEARING-DEFLECTION MONITOR

GEORGE A. KUHR (Rockwell International Corp.)

Apr. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MFS-19913

Vol. 11, No. 4, P. 56

Deflectometer probe monitors deflection of ball-bearing race in liquid oxygen with aid of small window or diaphragm. Diaphragm or window isolates optical deflectometer from liquid oxygen or other fluid in ball bearing. At high pressures, diaphragm integral part of housing preferable to window, since there would be no leakage.

B87-10191

HEAT-CONDUCTING ANCHORS FOR THERMOCOUPLES

KENTON S. MACDAVID (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16317

Vol. 11, No. 4, P. 57

Metal particles in adhesive aid heat transfer. Aluminum caps containing silver-filled epoxy used as high-thermal-conductance anchors for thermocouples, epoxy providing thermal path between mounting surfaces and thermocouple measuring junctions. Normally, epoxy-filled aluminum caps used when measuring steady-state temperatures. Silver-filled epoxy used when thermocouple not isolated electrically from surface measured.

B87-10192

MICROPROCESSOR-BASED VALVED CONTROLLER

ARNOLD M. NORMAN, JR. (Rockwell International Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29172

Vol. 11, No. 4, P. 57

New controller simpler, more precise, and lighter than predecessors. Mass-flow controller compensates for changing supply pressure and temperature such as occurs when gas-supply tank becomes depleted. By periodically updating calculation of mass-flow rate, controller determines correct new position for valve and keeps mass-flow rate nearly constant.

B87-10193

INFLATABLE PERIMETER SEAL

CLAYTON C. SHEPHERD, JR. (Rockwell International Corp.)

Apr. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20608

Vol. 11, No. 4, P. 58

Effective, inexpensive pressure seal between two flat surfaces formed from silicone rubber tubing. Resembling refrigerator seal, pressure seal especially useful where shape of sealed region irregular or subject to change. Unlike gaskets and O-rings, tubing seals require no machined grooves or custom-made parts and not adversely affected by warpage of sealed surfaces.

B87-10194

LOW-TURBULENCE VALVE

ROBERT R. BELEW (Marshall Space Flight Center)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28058

Vol. 11, No. 4, P. 59

Valve opens and closes ports without introducing significant turbulence to fluid passing through. Developed for experiment involving mixing of solutions by diffusion. Allows diffusion of contents between adjacent chambers with minimum turbulent mixing. Holes in valve plates rotated clockwise into alignment to open valve and counterclockwise out of alignment to close valve. Stopping pin limits overall rotation to 120 degrees for opening and closing.

B87-10195

KEEPING FLOODLIGHT TEMPERATURE LOW

JOHN KISS (ILC Technology, Inc.)

Apr. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20524

Vol. 11, No. 4, P. 60

Safety in explosive atmospheres enhanced. Retainer for floodlight designed to undergo relatively small temperature rise. Reaches no more than 350 degrees F (177 degrees C) with lamp operating at about 4,700 degrees F (2,600 degrees C). Satisfies 352 degrees F (188 degrees C) requirement for operation in some explosive atmospheres. Made of thermally conductive metal with coating of material having low thermal absorptivity/emissivity ratio so it conducts heat away from lamp and radiates to surroundings efficiently.

B87-10196

HIGH-PRESSURE TRANSDUCER PACKAGE

D. WAMSTAD (Honeywell, Inc.), and M. GLENN (Honeywell, Inc.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28054

Vol. 11, No. 4, P. 60

Enclosure for silicon device ensures accurate measurements of cryogenic liquids. Package holds silicon sensor in uniform compression around periphery and helps ensure accurate, stable, and repeatable pressure measurements. Mounting assembly

housed in package of stainless steel. Materials selected for equality of thermal expansion and for pressure-sealing properties. Besides its high-pressure, low-temperature characteristics, package withstands vibrations as severe as 400 times standard gravitational acceleration at 0 to 2,000 Hz.

B87-10197**PRESSURE-ASSISTED SEAL FOR CASTINGS**

DONALD E. STUCK (Rockwell International Corp.)

Apr. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MFS-19375

Vol. 11, No. 4, P. 61

Modification of widely used pressure-assisted gasket ensures tight seal even when one sealed surface somewhat rough or porous. Modified U-cross-section gasket has thin lips increasing sealing area and conform to slightly rough surface. Lips provide wider sealing area and extend highly loaded region at tip. Coating of polytetrafluoroethylene on tip and lip augments conformance.

B87-10233**GRIPS FOR LIGHTWEIGHT TENSILE SPECIMENS**

WILLIAM G. WITTE, JR., and WALTER D. GIBSON

May 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEL: 703-487-4650) (N86-11299/NSP)

LAR-13461

Vol. 11, No. 5, P. 46

Set of grips developed for tensile testing of lightweight composite materials. Double-wedge design substantially increases gripping force and reduces slippage. Specimen held by grips made of hardened wedges. Assembly screwed into load cell in tensile-testing machine.

B87-10234**SLOT-HEIGHT MEASURING SYSTEM**

ALAN D. CLARKE (United Technologies Corp.)

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11585

Vol. 11, No. 5, P. 46

Height displayed as function of position. Slot-depth measuring system uses spring-loaded transducer to measure slot depth and wheel-driven rotary optical encoder to measure position along slot. An x-y recorder plots depth vs. position.

B87-10235**FILLING AN UNVENTED CRYOGENIC TANK**

PHILLIP BECK (Beech Aircraft Corp.), and GARY S. WILLEN (Beech Aircraft Corp.)

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20652

Vol. 11, No. 5, P. 48

Slow-cooling technique enables tank lacking top vent to be filled with cryogenic liquid. New technique: pressure buildup prevented through condensation of accumulating gas resulting in condensate being added to bulk liquid. Filling method developed for vibration test on vacuum-insulated spherical tank containing liquid hydrogen.

B87-10236**HARD SUIT WITH ADJUSTABLE TORSO LENGTH**

HUBERT C. VYKUKAL

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11616

Vol. 11, No. 5, P. 55

Torso sizing rings allow single suit to fit variety of people. Sizing rings inserted between coupling rings of torso portion of hard suit. Number of rings chosen to fit torso length of suit to that of wearer. Rings mate with, and seal to, coupling rings and

to each other. New adjustable-size concept with cost-saving feature applied to other suits not entirely constructed of 'hard' materials, such as chemical defense suits and suits for industrial-hazard cleanup.

B87-10237**HYDRAULIC CALIBRATOR FOR STRAIN-GAUGE BALANCES**

KENNETH SKELLY, and JOHN BALLARD

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11360

Vol. 11, No. 5, P. 56

Instrument for calibrating strain-gauge balances uses hydraulic actuators and load cells. Eliminates effects of nonparallelism, nonperpendicularity, and changes of cable directions upon vector sums of applied forces. Errors due to cable stretching, pulley friction, and weight inaccuracy also eliminated. New instrument rugged and transportable. Set up quickly. Developed to apply known loads to wind-tunnel models with encapsulated strain-gauge balances, also adapted for use in calibrating dynamometers, load sensors on machinery and laboratory instruments.

B87-10284**FATIGUE-TESTING APPARATUS FOR METAL MATRIX COMPOSITES**

LEONARD J. WESTFALL, and DONALD W. PETRASEK

Jun. 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEL: 703-487-4650) (N86-15378/NSP)

LEW-14457

Vol. 11, No. 6, P. 46

Thermal and mechanical load cycling simulated in realistic fatigue tests. Efficient joining of metal matrix composite components to supporting structures is major concern facing users of these materials. Lewis Research Center designed and developed two thermal/mechanical fatigue test facilities, one to test metal matrix composite specimens and another to test composite/metal attachment bond joints. Thermal/mechanical fatigue facility designed for testing metal matrix composites permits specimen-temperature excursions with controlled heating and loading rates. Second facility designed to test composite/metal attachment bond joints and to permit heating to maximum temperature of 1,400°C (760°C) within 10 min and cooling to 300°F (150°C) within 3 min. Facility has unique capabilities not found in other laboratories.

B87-10285**GROWING SINGLE CRYSTALS OF COMPOUND SEMICONDUCTORS**

ROBERT J. NAUMANN, SANDOR L. LEHOCZKY, and DONALD O. FRAZIER

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28137

Vol. 11, No. 6, P. 47

Defect reduced by preventing melt/furnace contact and suppressing convection. Large crystals of compound semiconductors with few defects grown by proposed new method. Such materials as gallium arsenide and cadmium telluride produced, with quality suitable for very-large-scale integrated circuits or for large focal-plane arrays of photodetectors. Method used on small scale in Earth gravity, but needs microgravity to provide crystals large enough for industrial use.

B87-10286**IMPACT DRIVER WITH INTEGRAL SLIDING HAMMER**

BILBY J. WALLACE (OAO Co.)

Jun. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MSC-20582

Vol. 11, No. 6, P. 48

Tool combines impact driver with sliding dead-blow hammer.

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Used for any purpose for which ordinary impact driver used; tightening fasteners or driving starter holes for drill. Tool protects user from accidental injury and surrounding equipment from damage that might occur from ordinary arm-wielded hammer. Especially useful in underwater work.

B87-10287 **CRYOGENIC SHUTTER**

ALLEN TYLER, and CASEY DE KRAMER
Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13068 Vol. 11, No. 6, P. 48

Electrically actuated shutter designed to operate many thousands of time at cryogenic temperatures. Open shutter allows light at wavelengths between 1 and 300 micrometers to enter instrument measures background cosmic radiation. Closed shutter blocks outside radiation from instrument and positions mirror to reflect light from internal source to instrument calibrated. Designed, if power failure occurs, shutter remains in or assumes open position so measurements continue without calibration.

B87-10288 **HARDNESS TESTER FOR POLYUR**

D. L. HAUSER (Martin Marietta Corp.), D. F. BURAS (Martin Marietta Corp.), and J. M. CORBIN (Martin Marietta Corp.)
Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28147 Vol. 11, No. 6, P. 57

Rubber-hardness tester modified for use on rigid polyurethane foam. Provides objective basis for evaluation of improvements in foam manufacturing and inspection. Typical acceptance criterion requires minimum hardness reading of 80 on modified tester. With adequate correlation tests, modified tester used to measure indirectly tensile and compressive strengths of foam.

B87-10340 **SIMULATION OF AIRPLANE AND ROCKET TRAJECTORIES**

MAGDY M. WAHBAH (McDonnell Douglas Corp.), MICHAEL J. BERNING (McDonnell Douglas Corp.), and TONY S. CHOY (McDonnell Douglas Corp.)
Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20933 Vol. 11, No. 7, P. 62

Simulation and Optimization of Rocket Trajectories program (SORT) contains comprehensive mathematical models for simulating aircraft dynamics, freely falling objects, and many types of ballistic trajectories. Provides high-fidelity, three-degrees-of-freedom simulation for atmospheric and exo-atmospheric flight. It numerically models vehicle subsystems and vehicle environment. Used for wide range of simulations. Written in machine-independent FORTRAN 77.

B87-10344 **MEASURING THE INTERLAMINAR SHEAR STRENGTHS OF COMPOSITES**

HAROLD E. KAUTZ
Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-10561/NSP)

LEW-14417 Vol. 11, No. 7, P. 71

Acousto-ultrasonic technique utilizing computer and waveform digitizer developed for nondestructive evaluation (NDE) of composite materials. Technique employed on filament-wound composite (FWC) specimens cut from sample segments of graphite/epoxy cylinders. Developed for use on large composite structures to verify integrity and assure reusability. Similar

applications of technique anticipated for variety of composite structures, such as pipelines and storage tanks.

B87-10345 **FIBER-OPTIC LATERAL-DISPLACEMENT SENSOR**

EDMUND J. ROSCHAK (Rockwell International Corp.)
Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29170 Vol. 11, No. 7, P. 72

Proposed fiber-optic sensor monitors axial position of shaft or bearing in turbomachine. Device senses position of non-magnetic as well as magnetic material and calibrates before assembly in machine. More compact. Concept extends to measure rotational speed of shaft.

B87-10346 **SIX-AXIS SUPERCONDUCTING ACCELEROMETER**

HO JUNG PAIK (University of Maryland)
Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-26040 Vol. 11, No. 7, P. 72

Sensitivity and short-term stability high. Design combines superconductivity and magnetic levitation to achieve linear-acceleration sensitivity greater than conventional linear accelerometers, and short-term angular stability better than conventional gyroscopes. Improved accelerometer used to increase precision in inertial navigation and surveying, as sensitive multiple-axis seismic sensor, as component of tensor gravity gradiometer, or to sense accelerations of stabilized platforms or spacecraft.

B87-10347 **MEASURING BEARING-CAGE ROTATION**

E. J. ROSCHAK (Rockwell International Corp.)
Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29182 Vol. 11, No. 7, P. 73

Bearing slip measured optically. Concept for measuring rotational speed of bearing cage promises to be simple and accurate. Based on fiber optics, requires no contact between measuring device and bearing, and would not introduce wear.

B87-10348 **VIBRATION-FREE VANES DIRECT CRYOGENIC FLOW**

GADICHERLA V. R. RAO (Rockwell International Corp.)
Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29180 Vol. 11, No. 7, P. 73

Upstream fluid-dynamic surface prevents oscillations. Simple structural addition to liquid-oxygen manifold prevents vibration and allows increased flow. T-shaped manifold uses vanes to distribute liquid oxygen. Far from vanes, spoiler suppresses vibrations caused by unstable dynamic coupling between flow and elasticity of vanes.

B87-10349 **HEATER FOR COMBUSTIBLE-GAS TANKS**

WALTER B. INGLE (Rockwell International Corp.)
Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29155 Vol. 11, No. 7, P. 74

Proposed heater for pressurizing hydrogen, oxygen, or another combustible liquid or gas sealed in immersion cup in pressurized tank. Firmly supported in finned cup, coiled rod transfers heat through liquid metal to gas tank. Heater assembly welded or bolted to tank flange.

B87-10350**REDUCTION OF ORIFICE-INDUCED PRESSURE ERRORS**

ELIZABETH B. PLENTOVICH, BLAIR B. GLOSS, JOHN W. EVES, and JOHN P. STACK

Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-20351/NSP)

LAR-13569**Vol. 11, No. 7, P. 74**

Use of porous-plug orifice reduces or eliminates errors, induced by orifice itself, in measuring static pressure on airfoil surface in wind-tunnel experiments. Piece of sintered metal press-fitted into static-pressure orifice so it matches surface contour of model. Porous material reduces orifice-induced pressure error associated with conventional orifice of same or smaller diameter. Also reduces or eliminates additional errors in pressure measurement caused by orifice imperfections. Provides more accurate measurements in regions with very thin boundary layers.

B87-10351**PROPELLANT TANKS FOR TETHERED ORBITAL REFUELING FACILITY**

L. KEVIN RUDOLPH (Martin Marietta Corp.), ERLINDA R. KIEFEL (Martin Marietta Corp.), and DALE A. FESTER (Martin Marietta Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21074**Vol. 11, No. 7, P. 75**

Thermodynamics, mechanical stability, and mass penalties affect design. Pair of reports presents design study for propellant tanks used in low gravity. Each tank, which most likely contains liquid H₂ or O₂, part of fuel depot tethered to station in orbit around Earth. Some engineering concepts in study applied to design of tanks for use on Earth in transport and storage of cryogenic liquids and other fluids requiring special handling.

B87-10352**COMPUTER PROGRAMS FOR SPACECRAFT MANEUVERS**

CLYDE CHADWICK (Caltech), and LANNY J. MILLER (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16332**Vol. 11, No. 7, P. 75**

Multiple-encounter, multiple maneuver voyages analyzed in detail. Report describes ADAM (Advanced Analysis of Maneuvers) system, integrated collection of computer programs to aid design and analysis of maneuvers for deep space voyages involving multiple maneuvers and multiple encounters with planets and moons. Used in planning Galileo mission and used in both planning and operation of Voyager mission. Modularity of ADAM allows use of entirely new models, algorithms, trajectories, and maneuvering schedules. Characteristic great asset when spacecraft does not perform as planned.

B87-10353**DYNAMICAL CONSIDERATIONS FOR TETHERED ORBITAL REFUELING FACILITY**

PETER W. ABBOTT (Martin Marietta Corp.), L. KEVIN RUDOLPH (Martin Marietta Corp.), and DALE A. FESTER (Martin Marietta Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21076**Vol. 11, No. 7, P. 76**

Report summarizes feasibility study for proposed gravity-gradient-stabilized refueling facility tethered to orbiting station. Includes results of preliminary dynamical analysis of fluid transfer and storage and compares alternative system configurations. Concepts introduced in these documents applied to design problems in more detailed study described in 'Propellant Tanks for Tethered Orbital Refueling Facility (MSC-21074).

B87-10354**COMPARING TEST DATA ON SCALE-MODEL HELICOPTER ROTORS**

CAHIT KITAPLIOGLU, and PATRICK SHINODA

Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-70960/NSP)

ARC-11722**Vol. 11, No. 7, P. 76**

Hovering data correlate well, but forward-flight data do not. Report compares acoustics and performance of small-scale helicopter rotor with those of full-scale rotor in both hovering and forward flight.

B87-10408**SEALED JOINTS FOR HARD SUITS OR ROBOTS**

HUBERT C. VYKUKAL

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11534**Vol. 11, No. 8, P. 58**

Shoulder-to-arm joint allows wearer to move with considerable freedom while sealing wearer from outside environment. Inner wall is set of bellows, compressed at inner arm and expanded at outer arm, but degree of compression or expansion changes continuously as arm moves. Joint also used on diving suits and on manipulation sleeves for autoclaves and high-vacuum boxes, and as protective cover for articulated torque drives in hostile environments.

B87-10409**COATINGS SHOW LAMINAR BOUNDARY-LAYER TRANSITIONS**

BRUCE J. HOLMES, PETER D. GALL, CYNTHIA C. CROOM, GREGORY S. MANUEL, and WARREN C. KELLIHER

Sep. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-21518/NSP)

LAR-13554**Vol. 11, No. 8, P. 60**

New method, utilizing liquid-crystal coatings, provides means to visualize transition in flight. Difference in levels of relative shear stress or skin friction between laminar and turbulent boundary layers one order of magnitude. Difference in skin friction is physical parameter to which liquid crystals respond. Transition measured and documented on aircraft in flight at altitudes above 20,000 ft., up to at least 50,000 ft. at subsonic and supersonic speeds. Technique has rapid response and reversible; capability of indicating unlimited number of transition locations during single flight.

B87-10410**THERMALLY ACTIVATED DRIVER**

WILLIAM H. KINARD, ROBERT C. MURRAY (PRC Kentron, Inc.), and ROBERT F. WALSH (PRC Kentron, Inc.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13583**Vol. 11, No. 8, P. 62**

Space-qualified, precise, large-force, thermally activated driver (TAD) developed for use in space on astro-physics experiment to measure abundance of rare actinide-group elements in cosmic rays. Actinide cosmic rays detected using thermally activated driver as heart of event-thermometer (ET) system. Thermal expansion and contraction of silicone oil activates driver. Potential applications in fluid-control systems where precise valve controls are needed.

B87-10411**HIGH-LIFT, LOW-PITCHING-MOMENT AIRFOILS**

KEVIN W. NOONAN (Aerostructures Directorate, U.S. Army/AVSCOM)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

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MD. 21240-0757

LAR-13215

Vol. 11, No. 8, P. 63

Two families of airfoil shapes improve rotor performance. Improvements enhance performances of helicopters and other rotorcraft but also applicable to aircraft propellers. Airfoil shapes best suited for inboard segment of rotor blade.

B87-10412

ELECTRONIC CALIPER HAS 1-MIL ACCURACY

DOUGLAS B. HARRINGTON (Rockwell International Corp.), and LINO A. ARAGON (Rockwell International Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20388

Vol. 11, No. 8, P. 64

New electronic caliper accurate within plus or minus 0.001 in. (0.025 mm) and provides both printout and digital display of thickness. Measurements take less than one-tenth time of mechanical-micrometer measurement. Operator slides probe along rib while measuring thickness between probe tips. Measured value appears on small display in operator's hand as well as on main display unit. Operator orders printout of measurements by pushing switch near thumb.

B87-10413

SIX-DEGREE-OF-FREEDOM VIBRATION SUPPRESSOR

DENNIS R. HALWES (Bell Helicopter Textron, Inc.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13581

Vol. 11, No. 8, P. 64

New system, total-rotor-isolation system (TRIS) employs liquid-inertia vibration-eliminator (LIVE) units, designed to isolate all six degrees of freedom of aircraft-fuselage dynamic response from continuously changing airloads developed by rotor. Vibration suppressor uses liquid mercury to damp vibrations. Results of flight tests indicated at least 95-percent reduction in vibration levels from rotor hub to pilot's seat.

B87-10414

TESTING ADHESIVE BONDS TO CLOTHS

DAVID G. THOMANN (Rockwell International Corp.)

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20707

Vol. 11, No. 8, P. 67

Nondestructive tool simple and inexpensive. Easy-to-use tool nondestructively tests strength of adhesive bond between cloth and straight rigid edge. Developed for testing advanced flexible reusable surface insulation.

B87-10415

MICROSCOPIC GAS-FLOW CONTROLLER

KENSALL D. WISE (University of Michigan)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11704

Vol. 11, No. 8, P. 68

Proposed flow-controlling and -measuring device made by batch solid-state microelectronic-fabrication techniques. Device contains ultrasensitive silicon capacitive pressure transducer, gas-flow channels etched in silicon wafer, and integrated microvalves. Used to control and monitor low gas flows at low pressures.

B87-10416

ACTIVE CONTROL OF TRANSITION AND TURBULENCE

LUCIO MAESTRELLO

Sep. 1987 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13532

Vol. 11, No. 8, P. 69

Two active means of manipulating boundary-layer flow developed, one controlling laminar-to-turbulent transition, other controlling amplitude of turbulent fluctuation. Purpose to control skin-friction drag over surfaces inside inlets and ducts. Resulting turbulence downstream has lower skin-friction drag than equivalent flow developing over same surfaces in absence of intervention. Heating strips trigger turbulence while transition amplitude and bandwidth controlled by acoustic signal.

B87-10471

CALCULATING WAVE DRAG ON AN AIRCRAFT

SAMUEL M. DOLLYHIGH, and CHARLOTTE B. CRAIDON

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13634

Vol. 11, No. 9, P. 66

Improved program based on more-accurate mathematical mode. WDAG2 calculates supersonic zero-lift wave drag of complex aircraft configurations. Incorporates extended capabilities for geometric input to enable use of more-accurate mathematical model. Engineer defines aircraft components as fusiform or non-fusiform by use of traditional parallel contours. Written in FORTRAN IV.

B87-10472

COMPUTER PROGRAM FOR FLOW IN A COMBUSTOR

LOUIS M. CHIAPPETTA (United Technologies Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14271

Vol. 11, No. 9, P. 66

New version of TEACH computer program developed specifically for use in analysis of subsonic, swirling, reacting, turbulent flow in cylindrical bluff-body research combustor. Combustor design widely used as research tool for mathematical modeling of gas turbines and for development of diagnostic instrumentation.

B87-10476

DETERMINING DIRECTIONS OF ULTRASOUND IN SOLIDS

EDWARD R. GENERAZIO, and DON J. ROTH

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-22962/NSP and N86-31913/NSP)

LEW-14473

Vol. 11, No. 9, P. 70

Ultrasound shadows cast by grooves. Improved method for determining direction of ultrasound in materials is shadow method using Scanning laser acoustic microscopy (SLAM). Direction of ultrasound calculated from dimensions of groove and portion of surface groove shields from ultrasound. Method has variety of applications in nontraditional quality-control applications.

B87-10477

HIGH-DIFFERENTIAL-PRESSURE HEAT EXCHANGER

EDWARD C. HYLIN (Rockwell International Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16947

Vol. 11, No. 9, P. 71

Heat exchanger accommodates large pressure difference between heat-transfer fluids. Designed so all welded joints inspected with x rays to ensure leak-free operation over many years. Joints between fluids and between each fluid and environment radiographically inspectable. Used in Stirling-cycle engines, including those in proposed nuclear and solar powerplants.

B87-10478**MEASURING VISCOSITIES OF GASES AT ATMOSPHERIC PRESSURE**

JAG J. SINGH, GERALD H. MALL (Computer Sciences Corp.), and CHEGINI HOSHANG (Old Dominion University)
 Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel. 703-487-4650) (N86-24962/NSP)

LAR-13591**Vol. 11, No. 9, P. 72**

Variant of general capillary method for measuring viscosities of unknown gases based on use of thermal mass-flowmeter section for direct measurement of pressure drops. In technique, flowmeter serves dual role, providing data for determining volume flow rates and serving as well-characterized capillary-tube section for measurement of differential pressures across it. New method simple, sensitive, and adaptable for absolute or relative viscosity measurements of low-pressure gases. Suited for very complex hydrocarbon mixtures where limitations of classical theory and compositional errors make theoretical calculations less reliable.

B87-10479**FIBER-OPTIC TEMPERATURE SENSOR**

JONATHAN M. MARAM (Rockwell International Corp.)
 Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29164**Vol. 11, No. 9, P. 74**

Proposed sensor measures temperatures over wide range, from cryogenic liquids to burning gases. Made in part of optical fibers, sensor lighter in weight than thermocouple and immune to electromagnetic interference. Device does not respond to temperatures elsewhere than at sensing tip. Thermal expansion and contraction of distance between fiber end and mirror alters interference between light reflected from those two surfaces, thereby giving interferometric indication of temperatures.

B87-10480**GAMMA-RAY FUEL GAUGES FOR AIRPLANES**

JAG J. SINGH, DANNY R. SPRINKLE, GERALD H. MALL (Computer Sciences Corp.), and HOSHANG CHEGINI (Old Dominion University)

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel. 708-487-4650) (N86-28385/NSP)

LAR-13604**Vol. 11, No. 9, P. 74**

Accurate system overcomes problems of capacitance gauges. Feasibility study conducted on use of attenuation of gamma rays to measure quantities of fuel in tanks. Studies with weak Am241 59.5-keV radiation source indicate it is possible to monitor continuously fuel quantity in tanks to accuracy of better than 1 percent. Measurements also indicate easily measurable differences in physical properties and resultant attenuation characteristics of JP-4, JP-5, and Jet A fuels. Am241-based densitometers currently in use aboard some aircraft. Estimated complete system, including microprocessor and associated display devices, assembled at cost of less than \$10,000 per fuel tank.

B87-10481**THERMALLY INSULATING SUPPORT FOR CRYOGENIC TANKS**

RICHARD T. PARMLEY (Lockheed Missiles and Space Co.)
 Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel. 703-487-4650) (N85-17020/NSP)

ARC-11608**Vol. 11, No. 9, P. 79**

Passive alternate-load-path support scheme keeps weight low while conserving cryogenic liquid. Method of supporting inner vessel of large Dewar container minimizes heat conductance and weight but ensures high strength and impact resistance. Accommodates thermal expansion and contraction of vessel while introducing minimal stresses in structure. Inner vessel hangs from struts in outer vessel. Thin wall graphite/epoxy tube protected from high loads by close tolerance stops.

B87-10482**ANALYZING WAKES FROM HOVERING-HELICOPTER ROTOR BLADES**

D. B. BLISS (Continuum Dynamics, Inc.), D. A. WACHSPRESS (Continuum Dynamics, Inc.), T. R. QUACKENBUSH (Continuum Dynamics, Inc.), and A. J. BILANIN (Continuum Dynamics, Inc.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11675**Vol. 11, No. 9, P. 80**

New method for analyzing free wake of hovering-helicopter rotor produces more reliable results and requires less computer time. Copes with wake instabilities, both physical and numerical, that afflict usual time-stepping analysis methods. Tip-vortex position, in coordinates moving with rotor blade, updated in relaxation procedure. Wake-airflow solution reached when updates converge to steady wake shape.

B87-10483**MEASURING AND PLOTTING SURFACE-CONTOUR DEVIATIONS**

LINO A. ARAGON (Rockwell International Corp.), THOMAS SHUCK (Rockwell International Corp.), and LEROY K. CROCKETT (Rockwell International Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21163**Vol. 11, No. 9, P. 83**

Hand-held device measures deviation of contour of surface from desired contour and provides output to x-y plotter. Carriage on device rolled along track representing desired contour, while spring-loaded stylus on device deflects perpendicularly to track to follow surface. Operator moves carriage of contour-measuring device on beamlike track. Stylus on carriage traces contour of surface above it. Carriage of measuring device holds transducer measuring cross-track displacement of surface from desired contour, and multiple-turn potentiometer measuring position along track.

B87-10484**COLOR-VIDEO THERMAL MAPS**

W. R. WAGNER (Rockwell International Corp.), C. A. LAREN (Rockwell International Corp.), and W. T. TONIS (Rockwell International Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29223**Vol. 11, No. 9, P. 84**

Computer-simulation method produces color-video representation of temperatures in combustion-chamber wall. New method displays two-dimensional or three-dimensional temperature variation. Colors in display represent specific temperature ranges. Colors change to show changes in temperature with flow, pressure, heat flux, and other factors during startup, steady-state operation, and shutdown.

B87-10485**STIFFENING HEAT-EXCHANGER TUBES AGAINST VIBRATIONS**

G. V. R. RAO (Rockwell International Corp.)

Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-19907**Vol. 11, No. 9, P. 84**

Midsection clamps reduce harmful effects of crossflow. Clamp bolts onto four tubes, increasing stiffness and natural frequency. Unstable vibrations suppressed.

B87-10486**LEAD SCALES FOR X-RADIOGRAPHS**

RICHARD K. BURLEY (Rockwell International Corp.), and JAMES F. ADAMS (Rockwell International Corp.)

Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29247**Vol. 11, No. 9, P. 85**

Indentations made by typing on lead tape. Lead scales for inclusion in x-radiographs as length and position references created by repeatedly imprinting character like upper-case I, L, or V, or lower-case L into lead tape with typewriter. Character pitch of typewriter serves as length reference for scale. Thinning of tape caused by impacts of type shows up dark in radiograph.

B87-10487**EXPERIMENTS IN BOUNDARY-LAYER TURBULENCE**

JAMES M. KENDALL, JR. (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16754**Vol. 11, No. 9, P. 85**

Motion in layer highly three-dimensional. Report describes experimental studies of disturbances induced by weak free-stream turbulence in pre-transitional Blasius boundary layer. Asks and partially answers some fundamental questions concerning large-amplitude, low-frequency disturbances.

B87-10488**PRELIMINARY-DESIGN SOFTWARE FOR COMPOSITE STRUCTURES**

CHARLES N. EASTLAKE (Embry-Riddle University)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27153**Vol. 11, No. 9, P. 85**

Easy-to-use program enables fast analysis and evaluation of rough designs. Report describes interactive program for preliminary approximate stress analysis of structures made of fiber-reinforced composite materials. Intended for personal computer, helps designer select or confirm sizes of composite structural members. Useful in evaluating conceptual designs. Called COMPSIZE, program uses classical lamination theory to predict effective elastic modulus for laminate of arbitrary material and ply orientation. Written in Basic.

B87-10489**STRUCTURAL DYNAMICS OF FILAMENT-WOUND BOOSTER ROCKETS**

F. M. BUGG

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28155**Vol. 11, No. 9, P. 86**

Report summarizes program of measurements and calculations of vibrations in filament-wound composite models of Space Shuttle solid-rocket boosters. Vibrational behavior predicted by finite-element computer model of structural dynamics correlates well with data from tests on full- and quarter-scale models. Computer model developed with NASTRAN general-purpose structural-analysis computer code.

B87-10490**CALCULATIONS OF WALL EFFECTS ON PROPELLER NOISE**

KENNETH J. BAUMEISTER, and WALTER EVERSMA (University of Missouri)

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-29630/NSP)

LEW-14516**Vol. 11, No. 9, P. 86**

Reverberations affect sound levels in wind tunnels. Report describes calculations of acoustic field of propeller in wind tunnel having walls of various degrees of softness. Understanding provided by this and related studies necessary for correct interpretation of wind-tunnel measurements of noise generated by high speed, highly loaded, multiple-blade turbopropellers.

B87-10491**WATER-TUNNEL FLOW VISUALIZATION WITH A LASER**

CHRISTINE BECKNER, and ROBERT E. CURRY

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-11206/NSP)

ARC-11698**Vol. 11, No. 9, P. 87**

Experimental conditions for effective visualization determined. NASA technical Memorandum describes preliminary experiments in laser-enhanced flow visualization in water tunnel. Aspects of study include required laser power, flow seeding, model preparation, and photographic techniques. Results of study assist potential users in design and construction of similar equipment.

B87-10492**CONTROL AND SIMULATION OF SPACE-STATION VIBRATIONS**

CHE-HANG CHARLES IH (Caltech), SHYH JONG WANG (Caltech), and YU-HWAN LIN (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16852**Vol. 11, No. 9, P. 87**

Adaptive control system reduces effects of model uncertainties. Report outlines method for finite-element dynamic analysis of space station. Purpose is to determine periods and modes of oscillation of structure and to analyze effect of proposed adaptive control system to damp out unwanted vibrations. With simplifications proposed, finite-element simulations performed during dynamic event, like docking of Space Shuttle, and used to control vibration-damping actuators.

B87-10544**STEADY-STATE THERMAL-ANALYSIS PROGRAM FOR MICROCOMPUTERS**

S. W. PETRICK (Caltech), and C. L. CAGLE (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17179**Vol. 11, No. 10, P. 62**

Nodal-network model of heat flow implemented by computer program. Steady State Thermal Analysis Program, STEADY, provides thermal designer with quick and convenient method for calculation of heat loads and temperatures. Used on small nodal networks for conceptual or preliminary thermal design and analysis. Accepts up to 20 nodes of fixed or variable temperatures, with constant or temperature-dependent thermal conductivities, and any set of consistent units. Written in FORTRAN 77.

B87-10545**AERODYNAMIC-ANALYSIS PROGRAMS FOR MICROCOMPUTERS**

MARIE L. KNAPP (PRC Kentron, Inc.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13666**Vol. 11, No. 10, P. 62**

Lifts, drags, and moments calculated for subsonic and supersonic speeds. Series of computer programs used for aerodynamic analysis at NASA Langley Research Center modified for use on microcomputer. Programs include aerodynamic-analysis program for low-speed wing and flap systems (SUBAERF),

supersonic-wave-drag-analysis program (WDRAG2), and supersonic-lifting-surface program (Lift Analysis). Set up to run from common geometry format with appropriate additional input data for each particular program. Package written in FORTRAN 77.

B87-10546**COMPUTING LONG-TERM ORBITAL MOTIONS**

J. H. KWOK (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17052

Vol. 11, No. 10, P. 64

Drifts and lifetimes predicted. Long-term Orbit Predictor (LOP) is trajectory-propagation computer program used as analysis tool for studies of lifetimes of orbiting spacecraft. Used for any planetary orbiting missions. LOP written in FORTRAN 77.

B87-10547**NUMERICAL SIMULATION FOR SUPERSONIC INLETS**

M. O. VARNER (Sverdrup Technology, Inc.), W. R. MARTINDALE (Sverdrup Technology, Inc.), W. J. PHARES (Sverdrup Technology, Inc.), K. R. KNEILE (Sverdrup Technology, Inc.), and J. C. ADAMS, JR. (Sverdrup Technology, Inc.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14324

Vol. 11, No. 10, P. 64

Flows calculated for realistic engine-inlet conditions. Computer code LAPIN, large-perturbation inlet, developed to analyze large-perturbation, transient-flow fields in supersonic inlets. Robust, quick-running code capable of solving unsteady quasi-one-dimensional, inviscid-flow problems in mixed subsonic and supersonic regimes for inlets. Approach based upon quasi-one-dimensional, inviscid, unsteady formulation including engineering models of unstart/restart, bleed, bypass, and geometrical effects. Numerical solution of governing time-dependent equations of motion accomplished through shock-capturing, finite-difference algorithm. Program written in FORTRAN IV.

B87-10558**AIRPLANE WINGS FOR FASTER CLIMBING AND SLOWER LANDING**

SUSAN CLIFF-HOVEY

Nov. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11598

Vol. 11, No. 10, P. 82

Reshaped airfoils improve performance. Performances of general-aviation airplanes improved by modifying airfoil shapes. Equation used to determine new contour for each type of wing. Calculations straightforward enough to be done on hand calculator.

B87-10559**THREE-AXIS SUPERCONDUCTING GRAVITY GRADIOMETER**

HO JUNG PAIK (University of Maryland)

Nov. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-26041

Vol. 11, No. 10, P. 87

Gravity gradients measured even on accelerating platforms. Three-axis superconducting gravity gradiometer based on flux quantization and Meissner effect in superconductors and employs superconducting quantum interference device as amplifier. Incorporates several magnetically levitated proof masses. Gradiometer design integrates accelerometers for operation in differential mode. Principal use in commercial instruments for measurement of Earth-gravity gradients in geo-physical surveying and exploration for oil.

B87-10560**HEAT SHIELDS FOR TRANSATMOSPHERIC VEHICLES**

W. C. PITTS, and M. S. MURBACH (Sterling Software, Inc.)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11749

Vol. 11, No. 10, P. 87

Thermal-protection schemes evaluated for space vehicles bouncing off Earth atmosphere. Report compares performances of four conceptual heat shields for transatmospheric vehicles. These future spacecraft will operate above atmosphere of Earth but will dip into atmosphere to exploit combinations of aerodynamic and propulsive forces for such major maneuvers as changing orbital planes. Will experience high rates of aerodynamic heating during such maneuvers. Three concepts based on insulating tile fastened to skin of vehicle. Fourth conceptual system includes multilayer insulating blanket under heat shield of FRCI.

B88-10051**HOLDING X-RAY FILM INSIDE DUCTS**

RONALD V. BULTHUIS (Rockwell International Corp.), and DARRYL PIERCE (Rockwell International Corp.)

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29218

Vol. 12, No. 1, P. 80

Radiographic inspection of welds in walls of nonmagnetic ducts made easy by new film holder. X-Ray film inside duct held by interior and exterior magnets. Tether used to move holder and to retrieve it from inside duct.

B88-10052**HEAT EXCHANGER FOR ROTATING MODULAR STRUCTURES**

WILLIAM E. CLARK (Applied Technology Association)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26037

Vol. 12, No. 1, P. 80

Heat exchanger transfers heat from one structure to another while accommodating rotary motion of structures. Flat-panel heat exchanger passes heat from fluid in middle panel to fluid in outer panels. Diaphragm-like outer panels swell to conform to surfaces of middle panel, ensuring thermal contact. Rotary fluid coupling provides connection for both supply fluid and return fluid. Flexible hoses carrying fluid to and from coupling accommodate tilt of one structure with respect to other. Adapted to transfer of fluids and heat across joints of machine tools and robot arms and to flow of coolant through portable electronic equipment.

B88-10053**LAMINAR-BOUNDARY-LAYER CROSSFLOW SENSOR**

BRUCE J. HOLMES, HARLAN K. HOLMES, THOMAS C. MOORE, GREGORY S. MANUEL, and DEBRA L. CARRAWAY (Old Dominion University)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13436

Vol. 12, No. 1, P. 81

Crossflow vorticity detected with nonintrusive electronic sensor elements. Individual crossflow sensor elements respond to variation in heat transfer caused by laminar-crossflow vortices. Installed in variety of patterns, including staggered or combined into continuous longitudinal strip.

B88-10054**SWIVEL JOINT FOR LIQUID NITROGEN**

JAMES F. MILNER (Rockwell International Corp.)

Jan. 1988 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21180 Vol. 12, No. 1, P. 83

Swivel joint allows liquid-nitrogen pipe to rotate through angle of 100 degree with respect to mating pipe. Functions without cracking hard foam insulation on lines. Pipe joint rotates on disks so mechanical stress not transmitted to thick insulation on pipes. Inner disks ride on fixed outer disks. Disks help to seal pressurized liquid nitrogen flowing through joint.

B88-10055

SIMPLIFIED ANALYSIS OF SHOCK WAVES

WILMER E. NEUENSCHWANDER (Rockwell International Corp.)
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20738 Vol. 12, No. 1, P. 83

Semiempirical expressions and conventional analyses agree within about 3 percent. Set of semiempirical formulas enables direct calculation of supersonic and hypersonic shock-wave parameters without use of iterative procedures. Formulas provided for calculating shock deflection angle and downstream static pressure and enthalpy over mach number range of 2 to 25. Relationship describing thermodynamic behavior of partially dissociated air also developed.

B88-10056

ACOUSTICAL MEASUREMENT OF MINE-SHAFT LENGTH

JOSEPH S. HEYMAN
Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13519 Vol. 12, No. 1, P. 84

Acoustical system proposed to measure depth of a 'blind' shaft. Acoustic wave guided by shaft and provides estimate of shaft length, from which volume estimated. Acoustic-generator system determines resonant-frequency difference to measure shaft length.

B88-10057

ANALYSIS OF FLOW ACROSS CYLINDERS

SANG-WOOK KIM
Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N87-18781/NSP)

MFS-27180 Vol. 12, No. 1, P. 85

Report reviews various experimental, theoretical, and numerical methods of analysis of interactions between fluid and one or more cylinders across which it flows. Begins with discussion of mechanisms inducing vibrations in nests of cylinders. Major portion of review devoted to methods for numerical analysis of flow/cylinder interactions.

B88-10058

CALIBRATING NONREMOVABLE PRESSURE TRANSDUCERS

MICHAEL E. WATTS
Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N87-12830/NSP)

ARC-11792 Vol. 12, No. 1, P. 86

Report describes supplementary calibration procedure for pressure transducers. Method developed for transducers that cannot be removed without damage. Units calibrated en masse in large pressure chamber.

B88-10117

VORTEX SUPPRESSORS REDUCE PROBE VIBRATIONS

ARTHUR J. HILL (Rockwell International Corp.)
Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29199

Vol. 12, No. 2, P. 66

Lightweight addition to probe reduces cyclical stress aerodynamically. Life expectancy of instrumentation probe for high-speed flow increased by addition of helical strakes to cylindrical shield surrounding probe. Strakes disrupt vortex shedding normally occurring in fast flows around cylindrical body.

B88-10118

CALCULATING ROTOR/STATOR INTERACTIONS

MAN MOHAN RAI

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-17014/NSP)

ARC-11724 Vol. 12, No. 2, P. 66

Analysis procedure and associated computer code use Euler equations of fluid motion and patched coordinate grids to simulate fluid flow about rotor airfoil moving with respect to stator airfoil. Procedure useful in studies of interactions between rotors and stators in turbines, propellers and nacelles on airplanes, and rotors and fuselages on helicopters.

B88-10119

BALLOON HOLDS X-RAY FILM IN POSITION

JOSEPH C. BEZAIRE (Rockwell International Corp.), and CLAUDIO ALONSO (Rockwell International Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29239 Vol. 12, No. 2, P. 70

Simple pneumatic apparatus holds x-ray film against inside wall of tube or cavity. Balloon expanded against confines of cavity to push x-ray film against inner wall. With assurance that x-ray image formed at wall, position of defect calculated accurately.

B88-10120

STRAIN ELEMENTS FOR STARDYNE COMPUTER PROGRAM

DALE O. CIPRA (Rockwell International Corp.), and RICHARD EHRGOTT (Rockwell International Corp.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29271 Vol. 12, No. 2, P. 70

Program 'tricked' into calculation of compatible strains. Simple mathematical substitution causes STARDYNE finite-element computer program to put out compatible static or dynamic strains for elements. Strains helpful in effort to correlate strain-gauge data with finite-element mathematical models.

B88-10121

ROTARY FLUID COUPLING

RON ZENTNER (Boeing Co.), GREGG D. RHODES (Boeing Co.), and DOUGLAS W. THORESON (Boeing Co.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21215 Vol. 12, No. 2, P. 71

Rotary coupling for heat-transfer fluid contains four lines for vapor and four corresponding liquid-return lines. This one allows unlimited rotation and does not have to be rewound to prevent damage to hoses. Fluid coupled with minimal leakage between stationary housing and inner rotating shaft.

B88-10122

COMPUTATIONAL FLUID DYNAMICS IN ROTARY-WING AERODYNAMICS

SANFORD S. DAVIS, and I-CHUNG CHANG

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11748 Vol. 12, No. 2, P. 72

Emerging techniques appear vital to progress in rotary-wing-airplane industry. Report reviews current trends in field of helicopter-rotor aerodynamics. Selected test cases used to demonstrate current research in computational fluid dynamics (CFD) vital to analysis and design of advanced rotor-craft.

B88-10123
EXPERIMENTAL TEST OF AERODYNAMIC COMPUTER PROGRAM

M. D. MADSON, and L. L. ERICKSON

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11733 Vol. 12, No. 2, P. 73

Linear potential-flow theory applied to advanced airplane design. Report discusses use of PANAIR computer program to predict airflow about advanced fighter aircraft. Predictions compared with measurements about scale model of aircraft in wind tunnel at mach numbers of 0.6, 0.9, and 1.2 and at angles-of-attack from 0 to 10 degree.

B88-10189
OPTICAL-FIBER TEMPERATURE SENSOR

EDMUND J. ROSCHAK (Rockwell International Corp.)

Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29279 Vol. 12, No. 3, P. 58

Temperature measured in rotating machinery without speed-limiting mechanical sliprings. Gap widens as temperature rises and narrows as temperature falls. Light reflected from piston face and recaptured by fiber bundle varies accordingly.

B88-10190
PRESSURE-SEALING OPTICAL COUPLING

TIMOTHY B. IRVIN (Rockwell International Corp.), and RICHARD E. FRENCH (Rockwell International Corp.)

Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29348 Vol. 12, No. 3, P. 58

Light signals passed out of high-pressure cryogenic environment. Optical coupling passes signals in fiber-optic channels across pressure-and-temperature barrier. Coupling made in different configurations and modified to suit requirements of different cryogenic instrumentation systems.

B88-10191
PREDICTING ROLL ANGLE OF A SPINNING SPACECRAFT

M. A. SMITH, and J. W. DYER

Mar. 1988 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A87-22674)

ARC-11788 Vol. 12, No. 3, P. 61

Data for corrections of attitude derived on Earth from secondary measurements. Paper describes how attitude of Pioneer 10 spacecraft controlled since spacecraft lost signal from Sun-sensor signal. Roll calculations in paper yields insight into environment of solar system at great distances.

B88-10192
EVALUATING SOLID-LUBRICANT FILMS

ROBERT L. FUSARO

Mar. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-19465)

LEW-14610 Vol. 12, No. 3, P. 61

Report describes experimental techniques for measuring properties of solid-lubricant films. Discusses experimental parameters. Reviews basic pin-on-disk configurations and methods

of preparing disks and applying solid lubricants. Techniques for constant-temperature testing, low-contact-stress testing, and temperature-versus-time testing presented. Suggests methods of measuring pin-wear volume and recommends ways of presenting data.

B88-10247
SIZING DYE-PENETRANT INDICATIONS OF DEFECTS

ORLANDO G. MOLINA (Rockwell International Corp.)

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29216 Vol. 12, No. 4, P. 52

Sizes of cracks and holes viewed through borescope measured. Reference chart makes it possible to estimate sizes of borescope-observed defects on inner walls of tubes or otherwise hidden. Used both for round defects like pits or pores and for elongated ones like cracks.

B88-10248
LOW-HEAT-TRANSFER TANK MOUNT

R. T. PARMLEY (Lockheed Missiles and Space Co.), and I. E. SPRADLEY (Lockheed Missiles and Space Co.)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11779 Vol. 12, No. 4, P. 57

Supporting element adapts to high or low side loads. Passive Orbital Disconnect Strut (PODS) for cryogenic tank engages an extra-strong member only during peak side or axial loads like those from vibrations, accelerations, and shocks. When side loads are low, support provided by lower-strength, lower-thermal-conductance, passive disconnect.

B88-10249
MULTISPAN-BEAM SHEAR TEST FOR COMPOSITE LAMINATES

DAWN C. JEGLEY, and JERRY G. WILLIAMS

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13605 Vol. 12, No. 4, P. 57

New approach for studying failure mechanism is use of multispans-beam shear test, which puts some regions of specimen in almost pure shear and enables observation of location of initial failure and way in which damage propagates. Test stopped at any time, such as when first failure event occurs, for study of phenomenon or taking photographs of failure event. Individual plies studied easily with long-distance microscope or from photographs taken during test.

B88-10250
DOOR OPENS FOUR WAYS

ANDREW D. MORRISON (Caltech)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16801 Vol. 12, No. 4, P. 58

Concept based on poppable hinges. Hinge system allows door to swing open on any of four edges. Proposed system consists of four separable ball joints resembling 'pop-it' beads, one at each corner of door. Made of molded plastic, joints cheap to make and install.

B88-10251
AEROELASTIC COMPUTATIONS FOR WINGS WITH LOADED TIPS

PETER M. GOORJIAN, EUGENE L. TU, and GURU P. GURUSWAMY (Sterling Software)

06 MECHANICS

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11753

Vol. 12, No. 4, P. 58

External fuel tanks or missiles degrade stability because of unsteady aerodynamics. Transonic aeroelasticity of wings with tip stores simulated with improved version of ATRAN3S computer code, previously used to study behavior of clean wings only. Output of code agrees well with wind-tunnel data.

B88-10252

TOOLMAKER'S MICROSCOPE WITH VIDEO MONITOR

ARIF S. AHMED (Rockwell International Corp.)

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29227

Vol. 12, No. 4, P. 59

Display accessories increase resolution and flexibility of use. Toolmaker's microscope equipped with video monitor, auxiliary lighting, and high-resolution readout devices enables noncontacting measurements of tiny slots, indentations, and similar features on parts. Measures places difficult or impossible to reach by mechanical means.

B88-10253

CALCULATIONS OF TRANSONIC FLOW ABOUT A WING

TERRY L. HOLST, KAREN L. GUNDY, JOLEN FLORES, NEAL CHADERJIAN, UNIVER KAYNAK (Stanford University), and SCOTT D. THOMAS (Sterling Software)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11803

Vol. 12, No. 4, P. 60

Report describes calculations of transonic airflows about wing in wind tunnel. Basic equations of flow used in study are Reynolds-averaged Navier-Stokes equations in strong conservation-law form. Equations of flow incorporated into finite-difference computer code called TNS (Transonic Navier-Stokes). Computational grid generated by solution of partial differential equations yielding smooth meshes conforming to surfaces of wing and wind tunnel.

B88-10254

PIEZOVISCOSITY IN LUBRICATION OF NONCONFORMAL CONTACTS

YEAU-REN JENG, BERNARD J. HAMROCK, and DAVID E. BREWE (U.S. Army Aviation Research and Technology Activity-AVSCOM)

Apr. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-21797)

LEW-14589

Vol. 12, No. 4, P. 61

Developments in theory of lubrication. Analysis of piezoviscous-rigid regime of lubrication of two ellipsoidal contacts. Begins with Reynolds equation for point contact. Equation nondimensionalized using Roelands empirical formula and Dowson and Higginson formula. Equation solved numerically. Solutions obtained for full spectrum of conditions to find effects of dimensionless load, speed, parameters of lubricated and lubricating materials, and angle between direction of rolling and direction of entrainment of lubricant.

B88-10291

UNSTEADY FLOW IN A SUPERSONIC CASCADE WITH SHOCKS

FRANK B. MOLLS, and WILLIS H. BRAUN

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14339

Vol. 12, No. 5, P. 56

Operating range of turbomachinery for which stability calculated extended. TIPS (Two In-Passage Shocks) calculates unsteady lifts and moments on compressor blade if relative mach number supersonic and if two shock waves in blade passage. Written in FORTRAN IV and run on IBM 3033 with 370TSS operating system.

B88-10292

COMPUTING FLOWS OVER WAVY SURFACES

JOHN C. LIN, BARBARA H. PITTS, and BALASUBRAMANIAN R. (Cambridge Hydrodynamics, Inc.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13659

Vol. 12, No. 5, P. 58

Wind/wave interactions, drags, and related phenomena predicted. WAVEGEM package of algorithms developed to study two-dimensional turbulent flow past wavy surfaces. Written in FORTRAN 66 for batch execution.

B88-10293

SPACE-STATION-INTERIOR NOISE-ANALYSIS PROGRAM

ERIC STUSNICK (Wyle Laboratories)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13766

Vol. 12, No. 5, P. 58

Intelligibility of speech evaluated for specified acoustical environments. Program makes systematic prediction of noise and vibration environment of craft defined by user and evaluates relative acceptability of predicted environment for effective communication by speech. Written in MicroSoft FORTRAN Version 3.3.

B88-10294

SPECTRUM-ANALYSIS PROGRAM

J. E. SOLOMON (Caltech), M. LEE (Caltech), A. S. MAZER (Caltech), and M. MARTIN (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17180

Vol. 12, No. 5, P. 59

Minerals identified in geological images. Imaging spectrometers provide sufficient spectral sampling to define unique spectral signature for each pixel. Written in C.

B88-10299

LIQUID-SEEDING ATOMIZER

HENRY L. B. SEEGLER

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11631

Vol. 12, No. 5, P. 62

Particles sprayed in drops of evaporating liquid. Placed near wind-tunnel inlet, atomizer sprays evaporating liquid containing solid particles into wind-tunnel airflow. Particles entrained in flow and scatter light, enabling flow to be observed optically. One end of atomizer slides on stationary pin to accommodate thermal expansion and contraction.

B88-10300

DESIGNING SHAFTS FOR LONG LIFE

STUART H. LOEWENTHAL

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-27661)

LEW-14517

Vol. 12, No. 5, P. 63

Improved method developed for choosing sizes of power-transmitting shafts for limited or unlimited service lives under variety of operating conditions. Stress versus fatigue life of

proposed shaft design plotted, modified to account for expected operating conditions and used to calculate shaft diameter required for given fatigue life. If diameter of shaft represented by plot equals or exceeds required diameter, shaft considered adequate.

B88-10301

MEASURING FAN-BLADE-TIP DISPLACEMENTS

ROBERT F. BERRY, JR.

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13722

Vol. 12, No. 5, P. 64

Magnets and Hall-effect transducers used to monitor tip-to-shroud clearances. Mounting permanent magnet in end of fan blade and monitoring tip-to-shroud distance by use of output of Hall-effect transducers affixed to surface of shroud. Transducers provide real-time information. By placing magnets in each fan-blade tip, complete set monitored sequentially as each blade rotates past sensor. Application in many rotating machines, providing surrounding materials nonmagnetic and temperatures not severe.

B88-10302

SIMPLIFIED DRAG ANALYSIS FOR NOZZLES

W. R. WAGNER (Rockwell International Corp.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29060

Vol. 12, No. 5, P. 64

Measurements, graphs and calculations combined to give realistic and convenient estimates. Pitot-tube measurements made at various distances from wall to obtain pressure distribution in viscous boundary layer. Pressure readings converted to mach numbers, and analytical expressions for mach-number profile of boundary layer fitted to mach numbers derived from pressure by adjusting shape factor. Applied to jet-expansion devices in turbines, compressors, and variety of other equipment.

B88-10303

TOOL EXTRACTS SMOOTH, FRAGILE TUBES

FRED G. SANDERS

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28185

Vol. 12, No. 5, P. 66

When laterally compressible tube too slippery to pull, simple tool does job. Consists of three linked sections of steel tube with sticky rubber on inside and handles on outside. Hinged sections encircle tube to be pulled. User pulls on handles to extract tube.

B88-10304

COUPLED AERODYNAMIC/ACOUSTICAL PREDICTIONS FOR TURBOPROPS

BRUCE J. CLARK, and JAMES R. SCOTT

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23598)

LEW-14588

Vol. 12, No. 5, P. 66

Report discusses use of coupled aerodynamic/ and acoustical computer codes to predict noise emitted by turbopropeller blades turning at supersonic tip speeds. To predict noise field, existing turboprop-noise computer code by Farassat modified to accept blade-pressure inputs from three-dimensional turbofan aerodynamical computer code by Denton.

B88-10305

BEHAVIOR OF JOINT SEAL IN SOLID ROCKET BOOSTER

CARLETON J. MOORE

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17039)

MFS-28257

Vol. 12, No. 5, P. 68

Report analyzes behavior of O-ring seals in case of Solid Rocket Booster. Numerical simulations of transient response of seal presented with measurements of relevant mechanical properties of O-rings to show there is range of operating conditions in which seal can fail.

B88-10306

HEATING DISTRIBUTIONS FOR AEROASSISTED VEHICLES

DAVID A. STEWART, and PAUL KOLODZIEJ (Sterling Software)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11754

Vol. 12, No. 5, P. 68

Report discusses anticipated distributions of temperature on symmetric and asymmetric large-angle blunt nose-cone space vehicles re-entering atmosphere. Report considers three cone angles; 100 degree, 120 degree, and 140 degree. Experimental surface-temperature data obtained on specimens made of thermal-protection materials proposed for vehicles. Discusses relationship between stagnation-point heat-transfer rate and bow-shock standoff distance for cones.

B88-10347

INVERSE DESIGN OF SIMPLE, UNBRANCHED DUCTS

J. D. STANITZ

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14420

Vol. 12, No. 6, P. 71

Program calculates shape of duct to obtain desired flow field. Computer program, DIN3D1, developed for inverse design of simple, unbranched ducts. Inputs from user to computer program are velocity distributions for all surfaces making up duct. Includes upstream and downstream velocity fields and velocities along streamlines forming lateral boundaries of duct. Output of program contains duct geometry and complete flow field through duct. Written in FORTRAN IV.

B88-10349

MINIATURE REMOTE DEADWEIGHT CALIBRATOR

FRANK H. SUPPLEE, JR., and PING TCHENG

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13564

Vol. 12, No. 6, P. 73

Miniature, computer-controlled deadweight calibrator developed to calibrate remotely force transducer located in cryogenic chamber. Used with microcomputer, calibration system automatically applies deadweight loads to skin-friction balance, records and reduces data, and prints out results. Actuator controller and interlocking-weight system key elements in precise, automatic transducer calibrator. Designed for full-scale load of 1,000 mg. Concept extended to accommodate other full-scale load ranges.

B88-10350

PROTECTING AIRPLANES FROM WIND SHEAR

RICHARD S. BRAY

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11801

Vol. 12, No. 6, P. 74

Improvements in flightpath displays help pilots avoid crashes in downbursts. Report presents computer-simulated response of large transport aircraft to downbursts of wind during takeoffs and landings. Simulation clearly demonstrates benefits of increased available energy in form of initial speed, initial altitude, or higher thrust-to-weight ratio.

B88-10351**REBOUND OF PREVIOUSLY COMPRESSED O-RING**

CARLETON J. MOORE

Jun. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17040)

MFS-27186**Vol. 12, No. 6, P. 74**

Report presents theoretical and experimental analysis of relaxation characteristic of O-ring of vinylidene fluoride-hexafluoropropylene copolymer of same composition used in solid rocket boosters on Space Shuttle flight 51-L. Study covers range of temperatures from 10 to 120 degree F. Presents one-dimensional mathematical model of response provided for both elastic response and creep.

B88-10383**MEASURING FLOW BY HOLOGRAPHIC INTERFEROMETRY**

YUNG H. YU, and JOHN K. KITTLESN (University of California, Los Angeles)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11728**Vol. 12, No. 7, P. 60**

Flow field reconstructed by computer-aided tomography. Holographic interferogram formed on photographic plate by interference between object and reference beams. Double-exposure interferograms taken with blade rotating and stationary at various positions processed to reconstruct mathematically airflow about model helicopter rotor blade.

B88-10384**LINEAR-ALIGNMENT TESTING GRIPS**

MICKEY R. GARDNER

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13493**Vol. 12, No. 7, P. 62**

Lateral movements of grips are eliminated for thin specimens. Design integrates linear bearings with close-tolerance matching rods into gripping chain. Rods fixed into load-measurement grip, load-applicator grip slides along them. Rods do not interfere with force being applied but prevent lateral motion of one grip relative to other.

B88-10385**STIFFENING RINGS FOR ROCKET-CASE JOINTS**

BRYCE W. THOMPSON (Morton Thiokol, Inc.), LARRY G. ADAMS (Morton Thiokol, Inc.), and MELDON J. MCINTOSH (Morton Thiokol, Inc.)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28269**Vol. 12, No. 7, P. 64**

Loss of seal preventable. Rotation of components joint reversed from that caused by normal outward bulge at joint, or else eliminated. Elimination or reversal of rotation by suitable amount prevents opening of gap on O-ring, thus preserving seal. Applicable to segmented terrestrial pressure vessels.

B88-10386**ACOUSTICAL TESTS OF A SCALE-MODEL HELICOPTER ROTOR**

CAHIT KITAPLIOGLU, and CHRISTOPHER KINNEY (H. S. Robinson, Inc.)

Jul. 1988 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A86-49575)

ARC-11773**Vol. 12, No. 7, P. 65**

Data obtained in simulated hovering flight in open environment. Report discusses measurements of sound generated in outdoor

hoovering tests of 1/6-scale, four bladed helicopter rotor. Information of delineation between acoustic near field and far field and on effect of simple boundary-layer-tripping device. Also covers rotor acoustics at low thrust and at high thrust.

B88-10427**DIVERGENT-TRAILING-EDGE AIRFOIL**

PRESTON A. HENNE (McDonnell-Douglas Corp.), and ROBERT D. GREGG (McDonnell-Douglas Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13374**Vol. 12, No. 8, P. 66**

Wedge concept integrated into basic airfoil design. Current airfoil design, DLBA 238, developed to produce airfoil with superior geometric characteristics and equivalent cruise aerodynamic characteristics. 'Trailing-edge wedge' concept improved by integration into basic airfoil design for DLBA 238. Trailing-edge thickness and maximum thickness constrained to be same as baseline DLBA 032. Base drag-penalty of wedge avoided. Airfoil upper-surface geometry held fixed.

B88-10428**RELIEF VALVE OPENS AND CLOSSES QUICKLY**

PAUL A. SVEJKOVSKY (Northrop Services, Inc.)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21209**Vol. 12, No. 8, P. 69**

Relief valve opens quickly to relieve excess pressure and closes quickly when pressure drops slightly below relief pressure. O-ring exposes one or more ports under high pressure, releasing excess pressurized fluid. Adjusting screw used to change compression on Belleville-spring washers and to set pressure at which valve opens. Designed for use aboard Space Shuttle to vent pressurized hydrazine to vacuum, valve concept useful in industrial applications where rapid opening, rapid closing, or low susceptibility to blockage by vented fluid required.

B88-10429**SHADOWGRAPHS OF HELICOPTER-ROTOR-TIP VORTEXES**

SHAKKOTAI P. PARTHASARATHY (Caltech), YOUNG I. CHO (Caltech), and LLOYD H. BACK (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16593**Vol. 12, No. 8, P. 70**

Optical apparatus produces full-scale or larger shadowgraph of tip vortexes of helicopter rotor. Stroboscope projects shadow image of helicopter rotor on large, square screen. Commercial, highly reflecting projection screen used; simply projecting image on white wall does not yield enough light for photographing vortexes with standard 35-mm camera. Apparatus adapts to use in large wind tunnels.

B88-10430**LAMINAR-SEPARATION SENSOR**

BRUCE J. HOLMES, HARLAN K. HOLMES, THOMAS C. MOORE, GREGORY S. MANUEL, CYNTHIA C. CROOM, and DEBRA L. CARRAWAY (Old Dominion University)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13463**Vol. 12, No. 8, P. 72**

Sensor detects flow reversal in boundary layer. Laminar-separation sensor provides means for detecting laminar-separation bubble by use of very thin, surface-mounted sensor. Consists of flush array of three proximate thin films. Middle film electronically heated by means of constant-temperature

anemometer (CTA). Outer films, one upstream and one downstream of middle film, incorporated into bridge circuit to respond as resistance thermometers. This sensor provides only known surface-mounted means for positively identifying pressure of laminar separation as cause of boundary-layer transition.

B88-10490**QUICKLY REMOVABLE VALVE**

JOHN S. ROBBINS (Rockwell International Corp.)

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21237**Vol. 12, No. 9, P. 77**

Unit removed with minimal disturbance. Valve inlet and outlet ports adjacent to each other on same side of valve body. Ports inserted into special manifold on fluid line. Valve body attached to manifold by four bolts or, alternatively, by toggle clamps. Electromechanical actuator moves in direction parallel to fluid line to open and close valve. When necessary to clean valve, removed simply by opening bolts or toggle clamps. No need to move or separate ports of fluid line. Valve useful where disturbance of fluid line detrimental or where fast maintenance essential - in oil and chemical industries, automotive vehicles, aircraft, and powerplants.

B88-10491**MEASURING VIBRATIONS WITH NONVIBRATION SENSORS**

ARTHUR J. HILL (Rockwell International Corp.)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29200**Vol. 12, No. 9, P. 77**

Information about vibrations of structure and/or of nonvibration sensor attached to structure extracted from output of sensor. Sensor operated in usual way except, output fed to power-spectral-density analyzer. Vibrational components easily distinguishable in analyzer output because they have frequencies much higher than those of more-slowly-varying temperature, pressure, or other normally desired components. Spectral-analysis technique applied successfully to high-frequency resistance changes in output of platinum-wire resistance thermometer: vibrational peaks in resistance frequency spectrum confirmed by spectrum from accelerometer. Technique also showed predicted 17-kHz vibrational resonance in strain-gauge-supporting beam in pressure sensor.

B88-10492**EASY-TO-USE CONNECTOR-ASSEMBLY TOOL**

JOHN W. REDMON, JR., and FRED JANKOWSKI

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28237**Vol. 12, No. 9, P. 78**

Tool compensates for user's loss of dexterity under awkward conditions. Has jaws that swivel over 180 degree so angle adjusts with respect to handles. Oriented and held in position most comfortable and effective for user in given situation. Jaws lined with rubber pads so they conform to irregularly shaped parts and grips firmly but gently. Once tool engages part, it locks on it so user can release handles without losing part. Ratchet mechanism in tool allows user to work handles back and forth in confined space to connect or disconnect part. Quickly positioned, locked, and released. Gives user feel of its grip on part. Frees grasping muscles from work during part of task, giving user greater freedom to move hand. Operates with only one hand, leaving user's other hand free to manipulate wiring or other parts. Also adapts to handling and positioning extremely-hot or extremely-cold fluid lines, contaminated objects, abrasive or sharp objects, fragile items, and soft objects.

B88-10493**MEASURING LIQUID DROPS IN GAS FLOW**

PRADIP G. PARIKH (Caltech), MIGUEL A. HERNAN (Caltech), VIRENDRA SAROHA (Caltech), and ANDRE H. YAVROUIAN (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16950**Vol. 12, No. 9, P. 79**

Nonintrusive optical technique enables measurement of drops of water ingested through aircraft-engine nacelle. Drops photographed by light of laser beam directed across nacelle inlet. Beam shaped by beam expander and slit into sheet 9 mm thick. Exposure time only 10 ns- length of laser pulse, and drop motion therefore frozen in each of series of photographs. Fluorescent dye added to water improves edge definition of photographic images of drops; scattered laser light and its interference effects filtered out and only light at fluorescence wavelength photographed. Technique used in research on ingestion of water from heavy rain or wheel spray, but adapts to any droplet-laden gas stream.

B88-10494**BEARING/BYPASS MATERIAL-TESTING SYSTEM**

JOHN H. CREWS, JR.

Oct. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-23660)

LAR-13458**Vol. 12, No. 9, P. 79**

System developed to test specimens in compression as well as tension while maintaining constant bearing/bypass ratio. Test specimen with centrally located hole is clamped between two bearing-guide plates using one bolt. Bearing-guide plates then secured to two bearing-load cells. Test specimen independently loaded at both ends, using two separate control systems identified as applied and bypass. If two end loads unequal, difference between them reacted as bolt-bearing load on specimen. Throughout test, two control systems synchronized by common input signal (increasing voltage). As result, loads remain proportional as they increase.

B88-10495**SEMI-AUTOMATIC PROBE-AND-DROGUE ATTACHMENT MECHANISM**

JOHN D. WANAGAS (Rockwell International Corp.)

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21254**Vol. 12, No. 9, P. 80**

Spring-loaded pawls provide quick coupling. As probe enters drogue during coupling, three spring-loaded pawls in probe latch probe in drogue, preventing accidental uncoupling. Then worm-gear mechanism turned by standard 0.25-in. (6.35-mm) tool transfers motion to central threaded shaft, extending cap at tip of probe until all play taken up. This centers probe in drogue and renders coupling pawls to extend again. New mechanism useful for coupling modular components in other applications where ease and security of attachment, precise final alignment, and ease of removal important and where stresses and bending reasonably low.

B88-10496**COMPUTATIONAL METHODS FOR COMPOSITE STRUCTURES**

CHRISTOS C. CHAMIS

Oct. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18614)

LEW-14640**Vol. 12, No. 9, P. 81**

Selected methods of computation for simulation of mechanical behavior of fiber/matrix composite materials described in report. For each method, report describes significance of behavior to be simulated, procedure for simulation, and representative results. Following applications discussed: effects of progressive degradation of interply layers on responses of composite structures, dynamic responses of notched and unnotched specimens,

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interlaminar fracture toughness, progressive fracture, thermal distortions of sandwich composite structure, and metal-matrix composite structures for use at high temperatures. Methods demonstrate effectiveness of computational simulation as applied to complex composite structures in general and aerospace-propulsion structural components in particular.

B88-10535

POSITIONING ROTORS IN TURBINE FLOWMETERS

EDWARD D. LYNCH (Rockwell International Corp.), DANIEL C. CHAN (Rockwell International Corp.), and MUNIR M. SINDIR (Rockwell International Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29331

Vol. 12, No. 10, P. 60

Lengths of wakes roughly proportional to thickness of vanes. Mathematical model simplifies analysis of effects of flow-straightening vanes in turbine flowmeter. Yields numerical solution of differential equations of flow for quick examination of effects of thicknesses of vanes and rate of flow on extent of wake behind vanes. From examination, minimum distance at which flowmeter rotor placed behind vanes determined.

B88-10536

SELF-PROTECTING HEAT EXCHANGER

WILLIAM R. WAGNER (Rockwell International Corp.)

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29286

Vol. 12, No. 10, P. 61

Double-wall heat-exchanger tube protects from overloads by changing thermal resistance automatically. When temperature at any location on tube increases above prescribed limit, thermal resistance through walls of tube increases at location. Prevents local excess heat load from overheating tube or boosting internal pressure and weakening tube, shortening life expectancy, or destroying it. When heat load falls to normal level, tube automatically lowers thermal resistance and resumes heat exchange at rated capacity.

B88-10537

CONDENSING, TWO-PHASE, CONTACT HEAT EXCHANGER

R. L. COX (LTV Aerospace and Defense Co.), J. A. OREN (LTV Aerospace and Defense Co.), and L. W. SAUER (LTV Aerospace and Defense Co.)

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21179

Vol. 12, No. 10, P. 62

Two-phase heat exchanger continuously separates liquid and vapor phases of working fluid and positions liquid phase for efficient heat transfer. Designed for zero gravity. Principle is adapted to other phase-separation applications; for example, in thermodynamic cycles for solar-energy conversion.

B88-10538

THREAD-MOUNTED THERMOCOUPLE

STANLEY W. WARD

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13475

Vol. 12, No. 10, P. 62

Thread-mounted thermocouple developed to accurately measure temperature of surrounding material. Comprised of threaded rod or bolt drilled along length, dual-hole ceramic insulator rod, thermocouple wire, optional ceramic filler, and epoxy resin. In contact with and takes average temperature of, surrounding material. Fabricated easily in size and metal to suit particular application. Because of simplicity and ability to measure average

temperature, widespread use of design foreseen in variety of applications.

B88-10539

SUPPORT FOR FRAGILE BORESCOPIES

WILLIAM S. BROWN (Rockwell International Corp.), and DAVID E. JANKE (Rockwell International Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29230

Vol. 12, No. 10, P. 63

Fixture supports thin borescopes during inspections through 0.0405-in. orifices. Porescopes, which have diameter of 0.037 in., extremely fragile and often fractured during inspections, contaminating inspected cavities with debris. Nylon guide tip and acrylic support sleeve and body protect and guide a fragile borescope. Support sleeve press-fitted on body and removed when little clearance around orifice inspected. Otherwise, it helps to stabilize fixture. Helps to prevent damage caused by vibrations and eliminates constantly moving view that afflicts unsupported small-diameter borescopes.

B88-10540

PORTABLE AIRFLOW METER

FRANK A. BURGETT, DONALD R. HARDWICK (Northrop Services, Inc.), and JOHNNY L. PORTER (Northrop Services, Inc.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21200

Vol. 12, No. 10, P. 63

Compact hand-held instrument measures airflow. Consists of hot-wire anemometer probe in flow-straightening tube that reduces swirling. Configuration developed empirically to reduce length of instrument to practical dimension for use and storage in confined space. Two versions of new straightener only 17 and 18 in. long. Weighs less than 8 lb. and readily stored on Space Shuttle, developed to measure airflow in waste-collection system during flight. Used on Earth to measure airflow in ventilation systems, vacuum cleaners, and the like.

B88-10541

SIMPLIFIED ANALYSIS OF VEHICLE/PAYLOAD VIBRATIONS

REGINALD R. J. YU (McDonnell-Douglas Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21231

Vol. 12, No. 10, P. 64

Simplified mathematical model of coupled vibrations of vehicle and its payloads used in stability analysis for control purposes. Multiple-payload stability criterion extension of single-payload criterion based on measurements and detailed calculations of fundamental vibrational modes of vehicle and payload. Represented in simplified form by coupled masses and springs vibrating in one dimension, each spring having stiffness that gives rise to previously determined fundamental vibrational frequency associated mass in absence of coupling with other mass. Developed to avoid complexity and cost of full vibrations/stability calculations for each different combination of Space Shuttle payloads, simplified analysis technique also useful in assessing stability in loaded airplanes, ships, trucks, cranes, and conveyor systems.

B88-10589

SINDA - SYSTEMS IMPROVED NUMERICAL DIFFERENCING ANALYZER

STEVE J. DAMICO (Lockheed Engineering and Management Services Co., Inc.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20891**Vol. 12, No. 11, P. 62**

Capability to model fluid flow added. SINDA is software system developed to solve physical problems governed by diffusion-type equations mathematically modeled by lumped-parameter representations. Used as general thermal analyzer with resistor-and-capacitor-network representations. Adapted to wide range of problems represented by Fourier, Poisson, Laplace, or other differential equations. Written in FORTRAN and Assembler.

B88-10590**CRASH-ENERGY-ABSORBING COMPOSITE SUBFLOOR STRUCTURE**

GARY L. FARLEY (Army Aviation Research and Technology Activity)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13697**Vol. 12, No. 11, P. 66**

Simple method of predicting energy-absorption capability of composite subfloor beam structure developed. Based upon weighted sum of energy-absorption capabilities of constituent elements of subfloor beam. Procedure general and applicable to wide range of subfloor beam structures.

B88-10591**COLLECTING HYPERVELOCITY PARTICLES INTACT**

PETER TSOU (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16858**Vol. 12, No. 11, P. 66**

Experiments conducted to develop targets capturing micrometeorites, dust, and other small particles in outer space traveling at speed of several kilometers per second. Principal criterion for such target; must stop particles while preserving mineralogical properties for subsequent analysis. Collection concept simple: foam or other underdense medium used to remove kinetic energy gently from impinging particle. Well-designed collector decelerates and stops particle without imposing stresses beyond critical stresses that damage particle thermally or mechanically. Target technology also useful in terrestrial studies of debris from explosions.

B88-10592**FAST DETECTION OF BREAKS IN DUCTS**

MATTHEW A. SMITH (Rockwell International Corp.), and RAY C. DELCHER (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29274**Vol. 12, No. 11, P. 68**

Breaks in optical fibers reveal failures in duct walls. Group of optical fibers wrapped around duct carries light beams from lasers to photodiodes. Break in duct breaks fiber bonded to it, interrupting path of light between laser and photodetector. Interruption used to command shutdown of engine or other system to minimize damage.

B88-10593**DOWEL REMOVER**

JERRY BLISSE (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29328**Vol. 12, No. 11, P. 69**

Special tool pulls dowel pins straight out of blind holes. Removes dowels without damaging them or possibly injuring user. Accepts most common dowel sizes, 1/8 to 5/8 inch. Tool is simple and inexpensive. Made from screw, threader bar, slotted pipe, and nut.

B88-10594**QUICK-DISCONNECT VALVES FOR MODULAR FLUID SYSTEMS**

CHARLES FLUGER (United Technologies Corp.), RUDOLF REXER (United Technologies Corp.), GEORGE J. ROEBELEN (United Technologies Corp.), and JOHN B. GREEN, JR. (United Technologies Corp.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28262**Vol. 12, No. 11, P. 69**

Maintainable valves being developed for use as interfaces between modules or other separable components in maintainable fluid systems. Pair of valves joins two plumbing subsystems, connected to or disconnected from each other and enabling either or both to be isolated upon disconnection. Relief valve built into cartridge of maintainable valve, cartridge removes for replacement or inspection. New valves designed for temperature-regulating equipment aboard space station, used with or without modifications in variety of liquid and low-pressure-gas systems on Earth.

B88-10595**DUAL-CANTILEVER-BEAM ACCELEROMETER**

EMMITT A. REYNOLDS, and FRANK H. SPECKHART (University of Tennessee)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

KSC-11235**Vol. 12, No. 11, P. 70**

Sensitivity to velocity changes along beam axis reduced. Weighted-end cantilever beams of accelerometer deflected equally by acceleration in y direction. When acceleration to right as well as up or down, right beam deflected more, while left beam deflected less. Bridge circuit averages outputs of strain gauges measuring deflections, so cross-axis sensitivity of accelerometer reduced. New device simple and inexpensive.

B88-10596**TRIBOLOGY - A SURVEY OF THE SCIENCE**

DONALD H. BUCKLEY, WILLIAM R. JONES, JR., HAROLD E. SLINNEY, ERWIN V. ZARETSKY, DENNIS P. TOWNSEND, and STUART H. LOEWENTHAL

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14550**Vol. 12, No. 11, P. 71**

Compendium presents six papers on tribology study of adhesion, friction, wear, and lubrication of solid materials in contact: collection of papers covering theory, practice, history, and research.

B88-10597**SERVICE LIVES OF RESTORED BEARINGS**

ERWIN V. ZARETSKY

Dec. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18820)

LEW-14704**Vol. 12, No. 11, P. 72**

Rebuilt units last almost as long as new ones. Report describes theoretical and experimental studies of lifetimes of restored ball and cylindrical-roller bearings. Results of this and related studies have implications of economy and safety in modern high-speed machinery, especially in aircraft industry, where inspection and rejection or replacing of bearings are new standard practice.

B88-10598**TRIBOLOGICAL PROPERTIES OF COAL SLURRIES**

ROBERT L. FUSARO, and DALE L. SCHRUBENS (Texas A&I University)

Dec. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD.

21240

LEW-14739**Vol. 12, No. 11, P. 72**

Report describes study of tribological properties of coal/methanol slurries with pin-on-disk tribometer. Coefficients of friction, rates of wear of steel pin, and morphological studies of worn surfaces conducted on pins and disks of AISI 440C HT stainless steel and M-50 tool steel, both used as bearing steels. Coal slurries considered as replacement fuels in terrestrial oil-burning facilities and possible fuels for future aircraft turbine engines. Rates of wear of metallic components through which slurries flow limit such practical applications.

B88-10599**TRAJECTORIES FOR SPACE AMBULANCE**

WALTER C. NELSON (Coleman Research Corp.), and SHIRO FURAKAWA (McDonnell-Douglas Astronautics Co.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11296**Vol. 12, No. 11, P. 73**

Report presents concept for space ambulance that moves as quickly and economically as possible between orbits. Describes variety of rendezvous maneuvers between space stations in geocentric orbits at altitudes ranging from 200 km to geosynchronous altitude. Analyzes minimum times to complete rendezvous with orbiting medical station.

B89-10026**ARTIFICIAL-SATELLITE-ANALYSIS PROGRAM**

JOHNNY H. KWOK (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17522**Vol. 13, No. 1, P. 46**

Artificial Satellite Analysis Program (ASAP) is general orbit-predicting computer program incorporating sufficient orbit-modeling accuracy for design and planning of missions and analysis of maneuvers. Suitable for study of planetary-orbit missions with spacecraft trajectories of reconnaissance (flyby) and exploratory (mapping) nature. Not written for specific mission and intended use for almost any planetary orbiting mission. Written in FORTRAN 77.

B89-10027**NUMERICAL SOLUTION OF NAVIER-STOKES EQUATIONS**

STUART E. ROGERS, DOCHAN KWAK, and JAMES L. C. CHANG

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-11964)

ARC-11794**Vol. 13, No. 1, P. 47**

Three-dimensional, incompressible flow simulated on computer. Report discusses mathematical basis of IN3SD computer code and application of code to several test problems. Relies heavily on use of pseudocompressibility to solve numerically three-dimensional Navier-Stokes equations of viscous, incompressible flow. With further study and some modification, valuable computational tool for solution of engineering problems in fluid dynamics.

B89-10028**SHOCK-INDUCED HEATING IN A ROCKET ENGINE**

RONALD R. LAGNADO (Rockwell International Corp.), and FARHAD RAISZADEH (Rockwell International Corp.)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29449**Vol. 13, No. 1, P. 48**

Misalignments give rise to hotspots on walls. Report discusses

numerical simulation of flow in and near small, ringlike cavity in wall of Space Shuttle main engine at junction of main combustion chamber and nozzle. Purpose to study effects of misalignments between combustion chamber and nozzle on transfer of heat into surfaces chamber, cavity, and nozzle. Depending on specific misalignment flow encounters forward-or backward-facing step leaving chamber and entering nozzle. Results in serious losses of performance and excessive heating of walls.

B89-10075**VENTING GASES WITH MINIMUM LOSS OF HEAT**

JAMES R. OCOIN (United Technologies Corp.), and JOSEPH GENOVESE (United Technologies Corp.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13133**Vol. 13, No. 2, P. 70**

Design of vent reduces radiative transfer of heat. Venting system allows gases to escape while minimizing loss of heat by radiation. Prevents excessive buildup of internal pressure on thermal blanket. Polyimide box serves as modular vent. Many modules combined to suit gas-flow requirements of equipment. Indirect flow paths, external thermal control film, and thermal blankets reduce radiative loss of heat from interior. Developed to permit outgassing from thermal-blanket-covered spacecraft during passage from atmosphere of Earth to vacuum of space, venting approach adaptable to thermal insulation in laboratory vacuum systems.

B89-10076**MEASURING THERMAL CONDUCTIVITIES OF ROUGH SPECIMENS**

ALOYS H. STRIEPENS (Rockwell International Corp.), and CHI-WANG CHANG (Rockwell International Corp.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21333**Vol. 13, No. 2, P. 70**

Thermal conductivity of irregularly surfaced specimen measured more accurately and reliably by use of heat-transfer adhesive establishing contact between specimen and reference standards. Method useful when specimen made up of fragments of material. Adhesive ensures good thermal contact to pieces not matching others in height. In rough-surfaced or unequally sized specimens, heat-flow pattern becomes distorted, and temperatures at measurement points do not accurately represent those throughout reference standards and specimen. Filling voids with conductive adhesive restores nearly uniform distribution heat flow.

B89-10077**DOUBLE-O-RING PLUG FOR LEAK TESTS**

JAMES H. GREENE (United Technologies Corp.)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28222**Vol. 13, No. 2, P. 72**

Pressure plug features redundant O-ring bore seals and axial port opening laterally into space between O-rings to enable testing of seals. Axial passage in plug connected through radial passage to space between O-rings. Opening used to test O-rings, then sealed with smaller O-ring compressed by machine screw. Useful to seal test or cleanout holes normally kept closed in hydraulic actuators, pumps, and other pressurized systems.

B89-10078**HIGH-CAPACITY HEAT-PIPE EVAPORATOR**

J. A. OREN (LTV Corp.), R. J. DUSCHATKO (LTV Corp.), F. E. VOSS (LTV Corp.), and L. W. SAUER (LTV Corp.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

MSC-21272**Vol. 13, No. 2, P. 73**

Heat pipe with cylindrical heat-input surface has higher contact thermal conductance than one with usual flat surface. Cylindrical heat absorber promotes nearly uniform flow of heat into pipe at all places around periphery of pipe, helps eliminate hotspots on heat source. Lugs in aluminum pipe carry heat from outer surface to liquid oozing from capillaries of wick. Liquid absorbs heat, evaporates, and passes out of evaporator through interlug passages.

B89-10079**OPTIMIZING LOCATIONS OF NODES TO REDUCE VIBRATIONS**

HOWARD M. ADELMAN, JOCELYN I. PRITCHARD (USAARTA-AVSCOM), and RAPHAEL T. HAFTKA (Virginia Polytechnic Inst. and State Univ.)

Feb. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-31069)

LAR-13716**Vol. 13, No. 2, P. 73**

Distribution of mass modified to move nodes to desired locations. Modal shaping proposed as method to reduce structural vibration. Current optimization technique deals with placement of nodal points, related to modal shaping and consists of modifying distribution of mass of structure to place node of mode at desired location. Key to procedure; analysis of sensitivity of locations of nodes, provides straightforward expressions for derivatives of locations of nodes.

B89-10080**DENSITOMETRY BY ACOUSTIC LEVITATION**

EUGENE H. TRINH (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16849**Vol. 13, No. 2, P. 74**

'Static' and 'dynamic' methods developed for measuring mass density of acoustically levitated solid particle or liquid drop. 'Static' method, unknown density of sample found by comparison with another sample of known density. 'Dynamic' method practiced with or without gravitational field. Advantages over conventional density-measuring techniques: sample does not have to make contact with container or other solid surface, size and shape of samples do not affect measurement significantly, sound field does not have to be known in detail, and sample can be smaller than microliter. Detailed knowledge of acoustic field not necessary.

B89-10081**BOREScope INSPECTS WITH VISIBLE OR ULTRAVIOLET LIGHT**

ORLANDO G. MOLINA (Rockwell International Corp.)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29369**Vol. 13, No. 2, P. 75**

Quartz optical fibers improve performance at ultraviolet wavelengths. Borescope used to inspect interior of small-diameter tubing by visible light and ultraviolet light. Employs quartz fibers to conduct ultraviolet light and visible light with high efficiency.

B89-10082**CONSTRUCTING R-CURVES FROM RESIDUAL-STRENGTH DATA**

THOMAS W. ORANGE

Feb. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-18750)

LEW-14592**Vol. 13, No. 2, P. 75**

Old data exploited in new concept. Method devised for estimating crack-extension resistance curve (R-curve) from

residual-strength data on precracked fracture specimens. Enables inference of additional information from simple test results, and information used to estimate failure loads of more complicated structures of same material and thickness.

B89-10083**COMPLIANT ROBOT WRIST SENSES DEFLECTIONS AND FORCES**

LLOYD R. PURVES, FRANKLIN STREMEPEK, and TIMOTHY PREMACK

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12868**Vol. 13, No. 2, P. 76**

Precise parts assembled without damage. Goddard Space Flight Center developed compliant wrist that moves in any direction and rotates about any axis in response to applied forces. Deflection calibrated and instrumented so control computer measures degree of deflection and derives magnitude and direction of applied forces and torques. Compliant wrist brings to robots important capabilities humans use in manipulating objects. Helps prevent damage to precise, delicate parts during assembly by robot. Rod lengths, spring stiffnesses, and type of displacement sensor changed to suit different applications.

B89-10084**PLUG WOULD COLLIMATE X RAYS**

JEFFREY E. ANDERS (Rockwell International Corp.), and JAMES F. ADAMS (Rockwell International Corp.)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29343**Vol. 13, No. 2, P. 77**

Device creates narrow, well-defined beam for radiographic measurements of thickness. Cylindrical plug collimates and aligns X rays with respect to through holes in parts. Helps in determination of wall thickness by radiography. Lead absorbs X rays that do not pass axially through central hole. Lead/vinyl seals prevent off-axis rays from passing along periphery of plug.

B89-10085**STUDY OF FLOW ABOUT A HELICOPTER ROTOR**

MICHAEL E. TAUBER, and F. KEVIN OWEN (Compre, Inc.)

Feb. 1989 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A87-24033)

ARC-11790**Vol. 13, No. 2, P. 78**

Noninvasive instrument verifies computer program predicting velocities. Laser velocimeter measurements confirm predictions of transonic flow field around tip of helicopter-rotor blade. Report discusses measurements, which yield high-resolution orthogonal velocity components of flow field at rotor-tip. Mach numbers from 0.85 to 0.95, and use of measurements in verifying ability of computer program ROT22 to predict transonic flow field, including occurrences, strengths, and locations of shock waves causing high drag and noise.

B89-10086**VIBRATION-TESTING FACILITY FOR AIRCRAFT**

MICHAEL W. KEHOE

Feb. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-27655)

ARC-12141**Vol. 13, No. 2, P. 78**

Report describes equipment and techniques used in vibration testing of aircraft on ground at Dryden Flight Research Facility. Includes discussions of role of ground vibration testing in qualification of new and modified aircraft for flight and of experience gained from various applications.

B89-10130
SIMULATION OF SATELLITE TRAJECTORIES AND NAVIGATION

SIEN-CHONG WU (Caltech), WILLIAM I. BERTIGER (Caltech), JAMES S. BORDER (Caltech), STEPHEN M. LICHTEN (Caltech), RICHARD F. SUNSERI (Caltech), BOBBY G. WILLIAMS (Caltech), PETER J. WOLFF (Caltech), and JIUN-TSONG WU (Caltech)
 Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17442 Vol. 13, No. 3, P. 67

Orbit Analysis and Simulation Software, OASIS, is software system developed for covariance and simulation analyses of problems involving Earth satellites, especially Global Positioning System (GPS). Provides flexible, versatile, and efficient software tool for analysis of accuracy in Earth-satellite navigation and GPS-based geodetic studies.

B89-10133
TIRE FOOTPRINT AFFECTS HYDROPLANING ON WET PAVEMENT

THOMAS J. YAGER

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13683 Vol. 13, No. 3, P. 70

Recent investigations of tire hydroplaning at highway speeds reveal, in addition to inflation pressure, tire-footprint aspect ratio (FAR), defined as width divided by length of tire surface in contact with pavement, significantly influences speed at which dynamic hydroplaning begins. Tire speeds and forces developed during tests of up to 65 mi/h (105 km/h) were monitored on flooded test surface to identify development of hydroplaning. Study focused on automotive tires because FAR's of automotive tires vary more than those of aircraft tires.

B89-10134
MINIATURE FLOW-DIRECTION/PITOT-STATIC PRESSURE PROBES

GEORGE C. ASHBY, JR., DAVID S. COOMBS, JOHN W. EVES, HOWARD E. PRICE, and PETER VASQUEZ

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13643 Vol. 13, No. 3, P. 71

Precision flow-direction/pitot-static pressure probes, ranging from 0.035 to 0.090 inch (0.89 to 2.29 mm) in outside diameter, successfully fabricated and calibrated for use in Langley 20-inch Mach 6 Tunnel. Probes simultaneously measure flow direction and static and pitot pressures in flow fields about configurations in hypersonic flow at temperatures up to 500 degree F (260 degree C).

B89-10135
FLIGHT BALANCE FOR SKIN-FRICTION MEASUREMENTS

PING TCHENG, and FRANK H. SUPPLEE, JR.

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13710 Vol. 13, No. 3, P. 72

Skin-friction balance (flight balance) for use in flight on aircraft fuselage incorporates type-one, closed-loop control to make direct skin-friction force measurements. Curved surface element 2 in. (5.08 cm) in diameter used to sense tangential force of airstream passed over it. Linear electromagnetic force motor exerts restoring force that nulls position of sensing element. Applied skin-friction force measured by sensing amount of current through motor necessary to maintain null position. Unit is rugged, accurate, reliable, and easy to operate. Insensitivity of balance to background

rectilinear vibrations and ability to sustain large transient loads during takeoffs and landings make it attractive for flight testing.

B89-10136
INSPECTION IN OVERHEAD SPACES CONTAINING ASBESTOS

JACQUE BELL (Pan Am World Services, Inc.), GEORGE HARTWICK (Pan Am World Services, Inc.), and JERRY HUTCHERSON (Pan Am World Services, Inc.)

Mar. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21362 Vol. 13, No. 3, P. 73

Procedure for inspection in spaces above dropped ceilings that contain asbestos saves time and effort without sacrificing safety. With new method, only items of safety equipment needed are glove bag, storage bag, and roll of adhesive tape. Inspector tapes glove bag tightly to support grid around ceiling tile to be removed. With hands in gloves inspector lifts tile gently and places it aside. Extending head and shoulders into bag, inspector examines space above ceiling with help of flashlight.

B89-10137
ULTRASONIC DETECTION OF TRANSPLY CRACKS IN COMPOSITES

KENNETH J. BOWLES, HAROLD KAUTZ, JOHN H. HEMANN, and PAUL CAVANO

Mar. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-11758)

LEW-14700 Vol. 13, No. 3, P. 74

Nondestructive testing technique measures densities of transply cracks and used to monitor propagation of such damage in advanced polymer-matrix composite materials. Acousto-ultrasonic measuring apparatus, used to measure stress-wave factors (SWF's) of undamaged specimens and specimens that contained various numbers of transply cracks. Acousto-ultrasonic technique of value in examining damage to material from one surface only.

B89-10138
VARIABLE-VOLUME CONTAINER

A. K. COLLING (United Technologies Corp.), T. A. NALLETTE (United Technologies Corp.), and F. SANSEVERO (United Technologies Corp.)

Mar. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21355 Vol. 13, No. 3, P. 75

Container holds bed of beads securely while accommodating sizable changes in volume and allowing gases to flow through bed. Developed for air-purifying system in which carbon dioxide is removed by solid amine beads.

B89-10139
LIGHTWEIGHT RESTRAINT FOR COUPLING FLANGES

WILLIE D. WHITAKER (McDonnell-Douglas Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21211 Vol. 13, No. 3, P. 75

End flanges of flexible coupling system restrained against excessive rotation or axial separation by inexpensive, lightweight mechanism based on cables and pulleys. Restraining mechanism adapted to cable, duct, hose, or passageway couplings between vehicles, or to other applications in which angular and positional misalignments must be restricted to moderate specified values. Total misalignment of two end flanges limited to amount of slack available in cable-and-pulley mechanism. When cable taut, further axial separation of flange centers restrained, but small tilts accommodated by running of cable through pulleys.

B89-10140**MEASURING BEARING WEAR VIA WEIGHT LOSS**

JOHN E. KEBA (Rockwell International Corp.), and RICHARD S. MOORE (Rockwell International Corp.)

Mar. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29438**Vol. 13, No. 3, P. 77**

Wear in critical parts of bearings measured via amounts of weight lost during use. Technique applicable in general to bearings made of nonporous materials. Weight-loss measurements easier, faster, more precise, and less likely to damage measured parts. Weight-loss measurements performed in clean rooms and under constraint of extreme cleanliness for compatibility with liquid oxygen.

B89-10184**CALCULATING BUCKLING AND VIBRATIONS OF LATTICE STRUCTURES**

M. S. ANDERSON, B. J. DURLING, C. L. HERSTROM, F. W. WILLIAMS (Wales Univ. Inst. of Science and Technology), J. R. BANERJEE (Wales Univ. Inst. of Science and Technology), D. KENNEDY (Wales Univ. Inst. of Science and Technology), and D. B. WARNAAR (Delft Univ. of Technology)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13876 LAR-13791**Vol. 13, No. 4, P. 84**

BUNVIS-RG computer program designed to calculate vibration frequencies or buckling loads of prestressed lattice structures used in outer space. For buckling and vibration problems, BUNVIS-RG calculates deadload axial forces caused in members by any combination of externally-applied static point forces and moments at nodes, axial preload or prestrain in members, and such acceleration loads as those due to gravity. BUNVIS-RG is FORTRAN 77 computer program implemented on CDC CYBER and VAX computer.

B89-10185**OPTIMIZATION OF SIMULATED TRAJECTORIES**

GARRY L. BRAUER (Martin Marietta Corp.), DAVID W. OLSON (Martin Marietta Corp.), and ROBERT STEVENSON (Martin Marietta Corp.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13938 LAR-13953**Vol. 13, No. 4, P. 85**

Program To Optimize Simulated Trajectories (POST) provides ability to target and optimize trajectories of point-mass powered or unpowered vehicle operating at or near rotating planet. Used successfully to solve wide variety of problems in mechanics of atmospheric flight and transfer between orbits. Generality of program demonstrated by its capability to simulate up to 900 distinct trajectory phases, including generalized models of planets and vehicles. VAX version written in FORTRAN 77 and CDC version in FORTRAN V.

B89-10186**OPTIMIZING SIMULATED TRAJECTORIES OF RIGID BODIES**

GARRY L. BRAUER (Martin Marietta Corp.), DAVID W. OLSON (Martin Marietta Corp.), and ROBERT STEVENSON (Martin Marietta Corp.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13939 LAR-13954**Vol. 13, No. 4, P. 86**

6D POST is general-purpose, six-degree-of-freedom computer program for optimization of simulated trajectories of rigid bodies. Direct extension of three-degree-of-freedom POST program. 6D POST program models trajectory of powered or unpowered vehicle operating at or near rotating planet. Used to solve variety of

performance, guidance, and flight-control problems for atmospheric and orbital vehicles. Written in FORTRAN 77 and FORTRAN V.

B89-10187**COMPUTING FLUTTER BOUNDARIES**

ROBERT E. KIELB, and KRISHNA RAO V. KAZA

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14380**Vol. 13, No. 4, P. 87**

MISER2 computer program calculates flutter boundaries and aeroelastic response of cascade of arbitrarily mistuned airfoils. Based on typical section formulation incorporating incompressible, subsonic and supersonic cascade, unsteady aerodynamic theories. Each blade modeled as two-degree-of-freedom oscillator that has inertial coupling between bending and torsional motions. Written in FORTRAN 4.

B89-10188**SURFACE TENSION CONFINES CRYOGENIC LIQUID**

STEPHEN H. CASTLES, and MICHAEL E. SCHEIN

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13112**Vol. 13, No. 4, P. 88**

New type of Dewar provides passive, constant-temperature cryogenic cooling for scientific instruments under normal-to low-gravity conditions. Known as Surface-Tension-Contained Liquid Cryogen Cooler (STCLCC), keeps liquid cryogen in known location inside the Dewar by trapping liquid inside spongelike material. Unique sponge material fills most of volume of inner tank. Sponge is all-silica, open-cell material similar to that used for Space Shuttle thermal-protection tiles.

B89-10189**SENSING THE POSITION OF A PISTON IN A CYLINDER**

GORDON A. WIKER (Caltech), GEORGE M. TETSUKA (Caltech), THOMAS W. ANDREWS (Caltech), and RICHARD W. RICE (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16956**Vol. 13, No. 4, P. 90**

Position of piston in cylinder determined by series of ports and pressure-actuated electrical switches. Position-sensing scheme developed to help control movement of piston, which delivers fist-size objects to automatic mechanism at rate of less than 1 per second. Piston driven by either pressurized gas or hydraulic fluid. Position sensors have only fluid connections to cylinder. If cylinder or piston removed, not necessary to disturb electrical connections to switches. Scheme useful when electrical sensors create hazard or cause interference.

B89-10190**HATCH COVER SLIDES THROUGH HATCH**

CHARLES ALTON, and JAMES H. OKANE

Apr. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21356**Vol. 13, No. 4, P. 92**

Hatch cover for pressurized vessel provides tight seal but opened quickly from either side. In opening or closing, cover sweeps out relatively little volume within vessel, so it does not hinder movement of people or objects from vessel to outside or placement of people or objects near hatch. Cover uses internal pressure to create seal when closed. Design of cover eliminates leakage paths, and cover immune to hazards of sudden decompression or jamming when bolts and latches fail.

B89-10191**'SMART' ELECTROMECHANICAL SHOCK ABSORBER**LEBARIAN STOKES, DEAN C. GLENN, and MONTY B. CARROLL
(Lockheed Engineering and Management Services Co., Inc.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21368**Vol. 13, No. 4, P. 94**

Shock-absorbing apparatus includes electromechanical actuator and digital feedback control circuitry rather than springs and hydraulic damping as in conventional shock absorbers. Device not subject to leakage and requires little or no maintenance. Attenuator parameters adjusted in response to sensory feedback and predictive algorithms to obtain desired damping characteristic. Device programmed to decelerate slowly approaching vehicle or other large object according to prescribed damping characteristic.

B89-10192**LOW-COST VERTICAL ACCELEROMETER FOR AIRCRAFT**

RUSSELL A. PAIELLI

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11870**Vol. 13, No. 4, P. 94**

Self-aligning device measures vertical acceleration of aircraft but costs only small fraction of price of full inertial navigation system. Consists of accelerometer mounted vertically on inner gimbal of artificial horizon. Vertical accelerometer proves to be effective aid to Global Positioning System (GPS) navigation receivers in general-aviation aircraft and helicopters. Low-cost vertical accelerometer used to improve on vertical accuracy and reliability of GPS receiver alone. Also used to improve altitude accuracy for aircraft otherwise equipped with only baro-altimeter for altitude measurement.

B89-10193**DAMPER OF SMALL VIBRATIONS**

L. P. DAVIS (Honeywell Inc.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28244**Vol. 13, No. 4, P. 96**

Vibration damper has no rubbing parts. Thus eliminates even very small static frictional forces and therefore responds to and damps extremely low levels of vibration. Damper dissipates vibration by motion of piston in volume of silicone oil. Coaxial rigid shaft holds upper and lower bellows at constant length while piston vibrates up and down. Although volumes of upper and lower bellows change continually, total volume of bellows assembly stays same.

B89-10194**INFLATABLE-SEAL ASSEMBLY FOR CRYOGENIC FLUIDS**

KURT BUEHLER, and JAMES E. FESMIRE

Apr. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

KSC-11368**Vol. 13, No. 4, P. 99**

Connector for cryogenic fluid lines quickly joined or separated, seals tightly, and reduces transfer of heat to fluid. Features redundant sealing rings inflated after joining so they wedge tightly against connector base, preventing leakage. Cylinder of FEP inflatable. Pair of threaded stainless-steel rings - one at each end of cylinder - secure cylinder in quick-disconnect assembly.

B89-10195**PLACEMENT OF EXCITERS AND SENSORS TO MEASURE VIBRATIONS**

MOKTAR A. SALAMA (Caltech), THEODORE L. ROSE (Caltech),

and JOHN A. GARBA (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17293**Vol. 13, No. 4, P. 100**

Report discusses use of simulated-annealing algorithm to place exciters and sensors of vibrations at nearly optimal positions in complicated structure. Because there are generally fewer exciters and sensors than degrees of freedom in structure, optimal-placement algorithm needed to maximize value of resulting incomplete set of measurements for verification of amplitudes and frequencies of previously-computed vibrational modes.

B89-10251**OPTICAL TRACKER FOR LONGWALL COAL SHEARER**

PETER D. POULSEN, RICHARD J. STEIN, and ROBERT E. PEASE

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-25717**Vol. 13, No. 5, P. 74**

Photographic record yields information for correction of vehicle path. Tracking system records lateral movements of longwall coal-shearing vehicle. System detects lateral and vertical deviations of path of vehicle moving along coal face, shearing coal as it goes. Rides on rails in mine tunnel, advancing on toothed track in one of rails. As vehicle moves, retroreflective mirror rides up and down on teeth, providing series of pulsed reflections to film recorder. Recorded positions of pulses, having horizontal and vertical orientations, indicate vertical and horizontal deviations, respectively, of vehicle.

B89-10252**EFFECTS OF PYROTECHNICALLY GENERATED SHOCKS**

LAURENCE J. BEMENT, MARIA J. EVANS (Pennsylvania State Univ.), and VERNON H. NEUBERT (Pennsylvania State Univ.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13717**Vol. 13, No. 5, P. 76**

Research program provides better understanding of pyrotechnic phenomenon for design purposes. Evaluating potential for damage to spacecraft by activation of pyrotechnic mechanisms, pyrotechnic-shock tests conducted on three configurations: pin pullers on orthogonal double Hopkinson bar arrangement; pin pullers on mockup of Halogen Occultation Experiment (HALOE) structure; and section of separation joint on single Hopkinson bar. Strains and accelerations measured. Strains converted to output stresses, forces, and moments. Acceleration shock-response spectra obtained for both acceleration and force signals. Results of research useful to designers in making comparison and evaluation tests before committing to costly spacecraft hardware.

B89-10253**COOLANT-CONTROL VALVES FOR FLUID-SAMPLING PROBES**

DONALD F. SCHULTZ

May 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14687**Vol. 13, No. 5, P. 77**

Small built-in leaks prevent overheating. Downstream flow-control globe valve replaced with modified gate valve. Modification consists of drilling small hole through valve gate, so valve never turned completely off. This 'leaky' valve provides enough flow of coolant to prevent overheating causing probe to fail. Principle also applied to automatic control system by installing small bypass line around control valve.

B89-10254**MEASURING TENSION IN A TETHER**

E. M. HINMAN

May 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28321**Vol. 13, No. 5, P. 78**

Proposed instrument measures tension in tether and transmits data on tension so tension monitored or adjusted as necessary. Positioned along length of tether, which measures tension only at ends. Device includes strain gauge to sense tension. Output of strain gauge controls modulation of battery- or solar-powered radio transmitter. In another version, transmitter receives radio signal on one frequency and returns signal on another frequency with modulation signifying tension. Yet another version, data on tension carried on beam of light. Laser-diode transmitter powered by battery, radio beam, beam of light, or solar energy.

B89-10255**EFFICIENT COMPUTATION OF BEHAVIOR OF AIRCRAFT TIRES**

JOHN A. TANNER, AHMED K. NOOR (Joint Inst. for Advancement of Flight Sciences), and CARL M. ANDERSEN (College of William and Mary)

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17690)

LAR-13815**Vol. 13, No. 5, P. 79**

NASA technical paper discusses challenging application of computational structural mechanics to numerical simulation of responses of aircraft tires during taxing, takeoff, and landing. Presents details of three main elements of computational strategy: use of special three-field, mixed-finite-element models; use of operator splitting; and application of technique reducing substantially number of degrees of freedom. Proposed computational strategy applied to two quasi-symmetric problems: linear analysis of anisotropic tires through use of two-dimensional-shell finite elements and nonlinear analysis of orthotropic tires subjected to unsymmetric loading. Three basic types of symmetry and combinations exhibited by response of tire identified.

B89-10305**SPRING-BLADE IMPACT TESTER**

ALAN M. HOLMES (Lockheed Missiles and Space Co.), and JAMES W. CHAMPAGNE (Lockheed Missiles and Space Co.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13749**Vol. 13, No. 6, P. 72**

Record of energy relationships retrieved from compact, portable tester. Spring-blade impact tester developed to support evaluation of tolerance to damage of struts under consideration for use in Space Station. Approach offers potential for determining damage as function of change in relationship between applied and absorbed energies as applied energy successively increased with each impact. Impactor strikes specimen at moment of maximum kinetic energy after spring blades released from cocked position. Concept also provides potential for measuring behavior during impact, and energy relationships retrievable from oscilloscope traces of impact.

B89-10306**ALGORITHM FOR SOLUTION OF NAVIER-STOKES EQUATIONS**

SEOKKWAN YOON (Sverdrup Technology, Inc.)

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20243)

LEW-14656**Vol. 13, No. 6, P. 72**

Advantages of two previous algorithms combined. Steady-state Navier-Stokes equations put in implicit finite-difference form solved by approximate Newton iteration. LU-SSOR scheme is new relaxation method combining advantages of LU factorization with

Gauss-Seidel relaxation. Vectorizable LU-SSOR scheme, based on central differences, requires scalar diagonal inversions. Application of scheme to approximate Newton iteration of Navier-Stokes equations yields set of equations requiring no implicit smoothing on left side. Only adaptive, total-variation-diminishing, flux-limited dissipation terms added to right side. Algorithm used to predict laminar, turbulent, and hypersonic flows.

B89-10307**IMPROVED FLOW-CONTROLLING VORTEX GENERATOR**

EARL R. COLLINS, JR. (Caltech), WILBUR J. MARNER (Caltech), and NARESH K. ROHATGI (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17277**Vol. 13, No. 6, P. 73**

Symmetrical tangential streams control flow of radial primary streams. Vortex generator uses small secondary stream of fluid to control normally-larger primary stream. Improved version of vortex generator described in 'Variable Control Port for Fluidic Control Device,' (NPO-16603). Secondary, or control, flows entering tangentially through diametrically opposite ports set up swirling motion restraining primary flow. Pressure of secondary fluid in relation to primary fluid controlling factor. Like valve, vortex generator varies rate of flow of primary fluid from maximum value down to zero. When properly designed, requires low pressure differential between primary and secondary streams and expends relatively small amount of secondary fluid.

B89-10308**CLEANLY BURNING SQUIB**

DONALD B. BICKLER (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17112**Vol. 13, No. 6, P. 74**

Ignition wire repositioned to suppress unburned particles. In new configuration, ignition coil located near top of combustion chamber. As charge burns, unburned portion held at bottom of chamber. Little or no unburned charge ejected. Nearly uniform pressure generated, and only gases ejected from combustion chamber.

B89-10309**CAPILLARY-CONDENSER-PUMPED HEAT-TRANSFER LOOP**

CALVIN C. SILVERSTEIN (CCS Associates)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26046**Vol. 13, No. 6, P. 75**

Heat being transferred supplies operating power. Capillary-condenser-pumped heat-transfer loop similar to heat pipe and to capillary-evaporator-pumped heat-transfer loop in that heat-transfer fluid pumped by evaporation and condensation of fluid at heat source and sink, respectively. Capillary condenser pump combined with capillary evaporator pump to form heat exchanger circulating heat-transfer fluids in both loops. Transport of heat more nearly isothermal. Thermal stress in loop reduced, and less external surface area needed in condenser section for rejection of heat to heat sink.

B89-10310**CALCULATING FLOWS IN TURBOMACHINE CHANNELS**

LAWRENCE F. SCHUMANN (Army Aviation Research and Technology Activity)

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-15944)

LEW-14705**Vol. 13, No. 6, P. 76**

Noniterative integral-entrainment method yields good approximations. Method of approximate calculation of flow in channel of turbomachine based on interaction of viscous flow in boundary layers with inviscid flow in core layer. Faster and more robust than other approximate methods of same type. Suitable for use in preliminary calculations for design and for off-design operation of turbomachinery. Flows in conical diffuser channels represented by two-dimensional boundary-layer and one-dimensional core flows described by equations of new method.

B89-10311
STRUCTURALLY-TAILORABLE, NONLINEAR, SNAP-THROUGH SPRING

JAMES H. STARNES, JR., GARY L. FARLEY (Army Aerostructures Directorate), and WAYNE R. MANTAY (Army Aerostructures Directorate)

Jun. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13729 Vol. 13, No. 6, P. 77

Abrupt change in load/deflection response controllable and predictable. Structurally-tailorable, nonlinear, snap-through spring (STNSTS) exhibits controllable and predictable abrupt change in load/deflection response and based upon known phenomenon of snap-through structural response. Composed of pin-connected two-bar linkage which depicts combined tension/compression springs. As load applied to STNSTS, stiffness is function of internal spring and bending stiffness of pin-connected bars. As load increases, bars deform laterally until they collapse and snap through. Has application in passively-tailored rotor-blade flap, pitch, and lag response, to improve aerodynamic performance and stability characteristics of rotors; in aerodynamically- and aeroelastically-tailored wing spars and ribs, to produce tailored deformation state for improved effectiveness in maneuvering, aerodynamic performance, and stability characteristics; and in energy absorbers for automobile bumpers and aircraft land

B89-10312
THERMAL STRESSES IN SPACE-SHUTTLE WING

WILLIAM L. KO, and JERALD M. JENKINS

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23994)

ARC-12139 Vol. 13, No. 6, P. 79

Combined thermal deformations of wing-skin panel and TPS would not tear SIP layer. Report presents analysis of thermal stresses induced in skin panel, thermal-protection system (TPS), and strain-isolation pad (SIP) of Space Shuttle orbiter. Purpose of analysis to determine whether any part of above mentioned structures overstressed and overdeformed under reentry heating, assuming one TPS tile lost at end of reentry heating.

B89-10313
REDUCED-DYNAMIC TECHNIQUE FOR DETERMINATION OF ORBITS

SIEN-CHONG WU (Caltech), THOMAS P. YUNCK (Caltech), and CATHERINE L. THORNTON (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17386 Vol. 13, No. 6, P. 79

Orbits determined more accurately than in dynamic or geometric method. Report discusses reduced-dynamic technique for use of signals from satellites in Global Positioning System (GPS) to determine orbit of satellite in low orbit around Earth. Formed from combination of dynamic and geometric (nondynamic) tracking techniques, and combines advantages of both to increase accuracy of estimated orbit under conditions in which neither clearly superior.

B89-10314
QUALITY EVALUATION BY ACOUSTO-ULTRASONIC TESTING OF COMPOSITES

ALEX VARY

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20562)

LEW-14709 Vol. 13, No. 6, P. 81

Promising nondestructive-testing method based on ultrasonic simulation of stress waves. Report reviews acousto-ultrasonic technology for nondestructive testing. Discusses principles, suggests advanced signal-analysis schemes for development, and presents potential applications. Acousto-ultrasonics applied principally to assess defects in laminated and filament-wound fiber-reinforced composite materials. Technique used to determine variations in such properties as tensile, shear, and flexural strengths and reductions in strength and toughness caused by defects. Also used to evaluate states of cure, porosities, orientation of fibers, volume fractions of fibers, bonding between fibers and matrices, and qualities of interlaminar bonds.

B89-10366
PREDICTING THE PROPAGATION OF CRACKS

HU TIANLAI (Rockwell International Corp.)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13084 Vol. 13, No. 7, P. 62

Advanced Crack Propagation Predictive Analysis Program, FLAGR04, developed as aid in predicting growth of preexisting flaws and cracks in structural components. Provides fracture-mechanics analyst with computerized method of evaluation of 'safe crack-growth life' capabilities of structural components. Also used to evaluate tolerance-to-damage aspects of given structural design. Predicts growth of crack by use of two-dimensional model independently predicting growth of flaw in two directions based on calculation of stress-intensity factors. Input to FLAGR04 consists of initial definition of crack, type of rate solution, type and geometry of flaw, properties of material, data on load spectrum, load-stress functions, and design-limit stress levels. Output includes echo of input with any error or warning message and history of propagation of crack. Written in FORTRAN IV.

B89-10367
CARBON/CARBON PANELS COOLED BY HEAT PIPES

CHARLES J. CAMARDA, and PHILIP O. RANSONE

Jul. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13761 Vol. 13, No. 7, P. 64

Durable and reusable high-temperature carbon/carbon heat-pipe structure operates at temperatures above 3,000 degree F (1,649 degree C) in vacuum or inert environment and up to 2,800 degree F (1,537 degree C) in oxidizing environment. New concept combines high-temperature heat-pipe and carbon/carbon technologies to extend both thermal structural capabilities of refractory-metal heat pipes and maximum heat-flux capability of carbon/carbon structures. Uses refractory-metal heat pipes embedded within carbon/carbon structure. Walls of heat pipes thin and contain working fluid (lithium or sodium) of heat pipe. Carbon/carbon acts as primary load-carrying part of structure. Heat pipes help to eliminate local hotspots and associated thermal gradients and stresses and to reduce peak surface temperatures of carbon/carbon to levels within capability of oxidation-resisting system.

B89-10368
WHISTLE GAUGE MEASURES FLOW AND TEMPERATURE
 PARTHASARATHY SHAKKOTTAI (Caltech), and EUG Y. KWACK (Caltech)

Jul. 1989 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17243

Vol. 13, No. 7, P. 65

Simple, rugged gauge used to measure speed of flow and temperature of steam or other gas flowing through pipes of arbitrary diameter, from 1 to 28 in. or larger. Specially designed, instrumented whistle - has no moving parts, small, nonobstruction, operates at high temperature and pressure, and cleans itself. Does not operate at zero flow, but at moderate flows (tens of meters per second) generates intense sound for use in measurements. Consists of slanted ring groove of depth D and pressure taps in wall of pipe carrying flow to be measured. Resonant wavelength of sound generated by ring groove depends primarily on size and shape of groove and approximately equal to 4D.

B89-10369

NAVIER-STOKES CALCULATIONS WITH DEFORMING GRID

DENNIS L. HUFF

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-24435)

LEW-14711

Vol. 13, No. 7, P. 66

Scheme for numerical simulation of transonic, compressible, viscous flow about two-dimensional cascade of oscillating rigid airfoils involves finite-difference solution of Navier-Stokes equations on coordinate grid deforming with motions of airfoils. Contributes to understanding of flows around advanced turboprop airfoil sections. Cascade represented by periodic grid conforming to airfoils and to outer boundaries. Oscillation of airfoil represented by deformation of grid. Applications of deforming-grid technique includes turbomachinery and aeroelastic modeling of nonrigid airfoils.

B89-10370

PREDICTIONS OF FATIGUE DAMAGE FROM STRAIN HISTORIES

ROBERT A. SIRE (Failure Analysis Associates), PHILIP M. BESUNER (Failure Analysis Associates), and TIM TOOMEY (Failure Analysis Associates)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26060

Vol. 13, No. 7, P. 67

Semiempirical mathematical model of fatigue damage in stressed objects uses experimental histories of strains in those objects to predict fatigue lives. Accounts for initiation and propagation of fatigue cracks on cycle-by-cycle basis. Measured strain history first digitized, then converted to history of turning-point strains for purposes of analysis. Data between turning points not used. When model calibrated against proper test data for each type of object characterized, its predictions of fatigue lives superior to statistical models as one based on root-mean-square strain.

B89-10371

MEASURING LAMINAR-SEPARATION BUBBLES ON AIRFOILS

JOHN P. STACK, and SIVARAMAKRISHNAN M. MANGALAM (Analytical Services and Materials, Inc.)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13952

Vol. 13, No. 7, P. 68

Nonintrusive multielement heat-transfer sensor overcomes limitations of previous methods. New technique determines simultaneously extent of laminar boundary layer and locations of laminar separation, transition in separated layer, and turbulent reattachment. In tests, only small amounts of heat introduced, and heated thin films caused little disturbance to shear layer or to each other. Promising tool for measurements of stability of laminar boundary layers, separated shear layers, and transitional separation bubbles. Simple and capable of providing comprehensive picture

of state of shear flow along entire surface. Significant savings in tunnel (or flight) test time with corresponding savings in cost.

B89-10372

NAVIER-STOKES SIMULATION OF TURBINE ROTOR/STATOR INTERACTION

MAN MOHAN RAI

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-29750)

ARC-12185

Vol. 13, No. 7, P. 69

Patched-grid method used to effect three-dimensional Navier-Stokes numerical simulation of flow interacting with both rotor and stator in turbine. Involves use of two or more grids or sets of grids to solve finite-difference versions of Navier-Stokes or other equations of fluid flow. Ability to perform such calculations contributes to understanding of complicated turbomachinery flows and to consequent improvements in designs of turbomachinery.

B89-10373

COMPRESSION PYLON REDUCES INTERFERENCE DRAG

JAMES C. PATTERSON, JR., and JOHN R. CARLSON

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13777

Vol. 13, No. 7, P. 70

New design reduces total drag by 4 percent. Pylon reduces fuselage/wing/pylon/nacelle-channel compressibility losses without creating additional drag associated with other areas of pylon. Minimum cross-sectional area of channel occurs at trailing edge of wing. Velocity of flow in channel always nearly subsonic, reducing compressibility losses associated with supersonic flow. Flow goes past trailing edge before returning to ambient conditions, resulting in no additional drag to aircraft. Designed to compress flow beneath wing by reducing velocity in this channel, thereby reducing shockwave losses and providing increase in wing lift.

B89-10374

UPWIND SWIRL COUPLING IN NAVIER-STOKES CALCULATIONS

MORGAN WILLIAMS (Rockwell International Corp.)

Jul. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29542

Vol. 13, No. 7, P. 71

Convergence in axisymmetric flows speeded. Improved treatment devised for swirl-coupling source terms in finite-difference Navier-Stokes calculations of axisymmetric flow. Essence of improvement to treat radial- and swirl-velocity source terms in implicit manner wherever possible. Results in faster convergence and in convergence in some cases in which explicit treatment does not yield convergence at all.

B89-10409

SIMULATING THE GAMMA-RAY OBSERVATORY SPACECRAFT

J. GARRICK

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13147

Vol. 13, No. 8, P. 52

Gamma-Ray Observatory (GRO) spacecraft constitutes major advance in gamma-ray astronomy by offering first opportunity for comprehensive observations in range of 0.1 to 30,000 MeV. GRO Attitude Dynamics Simulator (GROSS) computer program designed to simulate mission. Consists of three separate programs: stand-alone profile program; simulator program, containing simulation control input/output (SCIO) subsystem, truth model (TM) subsystem, and on-board computer (OBC) subsystem; and postprocessor program. Written in FORTRAN 77.

B89-10410
COMPUTING STRESS, STABILITY, AND VIBRATION OF SHELLS

DAVID BUSHNELL (Lockheed Palo Alto Research Laboratory)
 Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13940 Vol. 13, No. 8, P. 52

BOSOR4 computer program developed as comprehensive program for analysis of stress, stability, and vibration of complex, branched shells of revolution made of elastic materials. Used to analyze prismatic shells and panels. Performs large-deflection axisymmetric stress analysis, small-deflection nonsymmetric stress analysis, modal vibration analysis with axisymmetric nonlinear prestress included, and buckling analysis with axisymmetric or nonsymmetric prestress. One main advantage, provisions for such realistic engineering details as eccentric load paths, internal supports, arbitrary branching conditions, and 'library' of wall constructions. Based on finite-difference energy method and offers very rapid convergence with increasing numbers of mesh points. Written in FORTRAN 77.

B89-10411
COMPUTING OPTIMAL MULTIARC TRAJECTORIES

DONALD J. JEZEWSKI (McDonnell-Douglas Corp.)
 Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21112 Vol. 13, No. 8, P. 54

Optimal Multi-Arc Trajectories (OMAT) computer program designed to calculate solution to optimal-trajectory problem in cases of low thrust-to-weight ratios. Developed for two-body exoatmospheric problem with three degrees of freedom in inverse-square force field. Offers two different options: impulsive changes in velocity and finite burns with low thrust-to-weight ratios. Two distinct solutions available from program: optimal multi-impulse (OMI) solution and optimal multiburn (OMB) solution. Two solutions obtained separately, or results of OMI solution used to guess unknown parameters of OMB solution. Written for DEC VAX-series computer. Written completely in FORTRAN 77.

B89-10412
MULTIPLE-BOUNDARY-CONDITION VIBRATION TESTS

CHIN-PO KUO (Caltech), and BEN K. WADA (Caltech)
 Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17351 Vol. 13, No. 8, P. 56

Multiple-boundary-condition testing method technique to improve analysis of vibrations in large structures. Conceived for vibrational testing, in terrestrial environment, of large, complicated three-dimensional structures intended for use in outer space. Objective of such testing, to identify parameters of mathematical models used to predict vibrations of such structures in absence of gravitation and air. Structure supported and/or restrained at several positions; excited at desired vibrational frequencies, and vibrations measured to determine characteristics of vibrational modes. Potential terrestrial uses in testing and evaluation of dynamics of towers and offshore structures and safety of large buildings in Earthquakes.

B89-10413
CHAOTIC MOTION OF A TWO-LINK PLANAR MECHANISM

ANATOLY LOKSHIN (Caltech), and MICHAEL A. ZAK (Caltech)
 Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17387 Vol. 13, No. 8, P. 58

Report discusses global instability in orbital motion of two-link planar mechanism. Principal objective, contributes to understanding

of chaotic motions in robot manipulators and other deterministic mechanical systems. Discussion begins with brief review of previous studies of chaotic motion and introduces notion of orbital instability in nonlinear systems. Introduces geometric approach useful in representation of orbital instability.

B89-10414
VIBRATING BEAM WITH SPATIALLY PERIODIC STIFFNESS

JOHN S. TOWNSEND
 Aug. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-23988)

MFS-27202 Vol. 13, No. 8, P. 58

Report presents theoretical analysis of vibrations of simply supported beam, bending stiffness varying about steady value, sinusoidally with position along length. Problem of practical importance because related to vibrations of twisted-pair electric-power transmission lines. Twists promote nonuniform shedding of vortices and prevents resonant accumulation of vibrational energy from wind.

B89-10457
CALCULATING TRANSONIC FLOWS ABOUT AIRFOILS

DAVID A. SEIDEL, JOHN T. BATINA, and WOODROW WHITLOW, JR.

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13899 Vol. 13, No. 9, P. 76

Small disturbances and aeroelastic effects simulated. XTRAN2L computer program used to calculate two-dimensional transonic flows about airfoils. Uses time-accurate, alternating-direction, implicit (ADI) finite-difference scheme to solve two-dimensional complete unsteady transonic small-disturbance equation. Engquist-Osher monotone spatial differencing used in ADI solution algorithm to provide robust and efficient program. Written in FORTRAN V.

B89-10458
CALCULATING TRAJECTORIES AND ORBITS

DANIEL J. ALDERSON (Caltech), FRANKLYN H. BRADY (Caltech), PETER J. BRECKHEIMER (Caltech), JAMES K. CAMPBELL (Caltech), CARL S. CHRISTENSEN (Caltech), JAMES B. COLLIER (Caltech), JOHN E. EKELUND (Caltech), JORDAN ELLIS (Caltech), GENE L. GOLTZ (Caltech), GERARLD R. HINTZ (Caltech) et al.
 Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17201 Vol. 13, No. 9, P. 76

Double-Precision Trajectory Analysis Program, DPTRAJ, and Orbit Determination Program, ODP, developed and improved over years to provide highly reliable and accurate navigation capability for deep-space missions like Voyager. Each collection of programs working together to provide desired computational results. DPTRAJ, ODP, and supporting utility programs capable of handling massive amounts of data and performing various numerical calculations required for solving navigation problems associated with planetary fly-by and lander missions. Used extensively in support of NASA's Voyager project. DPTRAJ-ODP available in two machine versions. UNIVAC version, NPO-15586, written in FORTRAN V, SFTRAN, and ASSEMBLER. VAX/VMS version, NPO-17201, written in FORTRAN V, SFTRAN, PL/1 and ASSEMBLER.

B89-10460
PIECEWISE-LINEAR COMPUTATION OF CREEP

JERALD JENKINS
 Sep. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23995)

ARC-12142 Vol. 13, No. 9, P. 80

Theory of elastic and inelastic stresses and strains in isotropic materials blended with finite-element computer programs to calculate residual stresses due to creep in structures. Analogy drawn between thermal expansion and creep, enabling use of thermal-stress computational approach to calculate creep stresses and strains. Overall transient solution obtained by piecewise-linear iterations. Creep stresses in structure computed in iterative process in which cumulative creep strains treated as fictitious changes in coefficients of thermal expansion.

B89-10461

DYNAMIC DELAMINATION BUCKLING IN COMPOSITE LAMINATES

JOSEPH E. GRADY, CHRISTOS C. CHAMIS, and ROBERT A. AIELLO

Sep. 1989 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

LEW-14745

Vol. 13, No. 9, P. 82

Procedure for mathematical modeling of dynamic delamination buckling and propagation of delamination, with plate bending elements and multipoint constraints, developed and incorporated into finite-element computer program. Predicts time at which delamination buckling occurs, shape of dynamic-buckling mode, and strain-energy-release rate due to extension of delamination crack. Method extended to handle such other defects as transply and edge cracks.

B89-10462

CAPILLARY-PUMPED HEAT-TRANSFER LOOP

Innovator not given (Thermacore, Inc.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27196

Vol. 13, No. 9, P. 84

New type of capillary-pumped heat-transfer loop primes itself at startup. Removes substantial quantities of heat like that generated by people and equipment in rooms and vehicles. Creates continuous path for its working fluid; both vapor and liquid move in same direction. Key element in operation of loop is formation of slugs of liquid, condensed from vapor and moved along loop by vapor bubbles before and after it. Both evaporator and condenser contain axial arteries carrying water. Heat entering evaporator from heat source provides energy for transport of fluid and heat. Dimensions in inches.

B89-10463

EXPANSION VALVE WITH TEMPERATURE-SENSITIVE FLOW REGULATION

GRAHAM WALKER (General Pneumatics Corp.), and KELLY HEDEGARD (General Pneumatics Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11372

Vol. 13, No. 9, P. 86

Joule-Thomson expansion valve designed so particles or condensed contaminants in vapor flowing through unlikely to clog orifice. In addition, new valve automatically adjusts flow of vapor. Allows high initial flow for rapid cooling, but gradually reduces flow as operating temperature reached. Flow adjusts manually when necessary. Developed for expansion of high-pressure vapors to condense them into low-pressure cryogenic liquids. Used to conserve helium coolant in superconducting system by condensing vapor boiling from liquid-helium bath.

B89-10464

HIGH-TEMPERATURE STRAIN-AND-TEMPERATURE GAUGE

S. P. WNUK (Hitec Products, Inc.), and S. J. LANIUS (Morton

Thiokol, Inc.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28320

Vol. 13, No. 9, P. 88

Two-element gauge used alternately in two different bridge circuits to measure both temperature and strain. Three-lead strain-and-temperature gauge developed for use at temperatures up to 750 degree F (390 degree C) on fiber-reinforced carbon/carbon composite material having coefficient of thermal expansion of 0.8 ppm/degree F. Unlike most temperature-compensated gauges, gauge gives accurate results even during rapid heating and cooling cycles. Similar gauges produced for materials with different coefficients of thermal expansion.

B89-10465

APPLYING THERMAL GRADIENTS TO CONTROL VIBRATIONS

DONALD L. EDBERG (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17067

Vol. 13, No. 9, P. 90

Thermal actuators used to stabilize large structures. New damping concept calls for application of suitably timed and shaped thermal-gradient waveforms to generate expansions and contractions counteracting vibrations. Responding to processed signal from accelerometer, thermoelectric heat pumps apply thermal gradients producing expansions and contractions in upper and lower caps of cantilever beam. These expansions and contractions partly counteract vibrations sensed by accelerometer, thus contributing to damping.

B89-10466

INTERACTION OF A HELICOPTER BLADE WITH A VORTEX

STEPHEN DUNAGAN, and THOMAS NORMAN

Sep. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-14962)

ARC-12196

Vol. 13, No. 9, P. 92

Measurements in wind tunnel yield data for validation of computations. Report describes experimental investigation of three-dimensional interaction of helicopter rotor blade with vortex like that generated by preceding rotor blade. Provides theoretical aerodynamicists with data for validation of computer simulations of aerodynamic flow.

B89-10467

PREDICTIVE ATTITUDE MAINTENANCE FOR A SPACE STATION

PHILIP D. HATTIS (Draper (Charles Stark) Lab., Inc.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21216

Vol. 13, No. 9, P. 93

Paper provides mathematical basis for predictive management of angular momenta of control-moment gyroscopes (CMG's) to control attitude of orbiting space station. Numerical results presented for pitch control of proposed power-tower space station. Based on prior orbit history and mathematical model of density of atmosphere, predictions made of requirements on dumping and storage of angular momentum in relation to current loading state of CMG's and to acceptable attitude tolerances.

B89-10518

GLAND WITH CANTILEVER SEAL

PATRICK B. MELTON (United Technologies Corp.)

Oct. 1989 No additional information available: For specific technical

questions contact TU Officer at Center of origin.

MFS-28328 Vol. 13, No. 10, P. 56

Single-piece gland forms tight seal on probe or tube containing liquid or gas at high pressure. Gland and probe align as assembled by simple torquing procedure. Disconnected easily and reused at same site. Made from any of wide variety of materials so compatible with application. Cantilever ring at top of gland bites into wall of tube or probe, sealing it. Wall of tube or probe must be thick enough to accommodate deformation without rupturing. Maximum deformation designed in coordination with seating and deformation of boss or conical seal.

B89-10519

MECHANICAL DEVICE TRACES PARABOLAS

TERRY A. SOPER (Lockheed Engineering and Management Services Co., Inc.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21421 Vol. 13, No. 10, P. 57

Mechanical device simplifies generation of parabolas of various focal lengths. Based on fundamental geometrical construction of parabola. Constancy of critical total distance enforced by maintaining cable in tension. Applications of device include design of paraboloidal antennas, approximating catenaries on drawings of powerlines or long-wire antennas, and general tracing of parabolas on drawings.

B89-10520

ALGORITHM FOR HYPERSONIC FLOW IN CHEMICAL EQUILIBRIUM

GRANT PALMER

Oct. 1989 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A89-33594)

ARC-12140 Vol. 13, No. 10, P. 57

Implicit, finite-difference, shock-capturing algorithm calculates inviscid, hypersonic flows in chemical equilibrium. Implicit formulation chosen because overcomes limitation on mathematical stability encountered in explicit formulations. For dynamical portion of problem, Euler equations written in conservation-law form in Cartesian coordinate system for two-dimensional or axisymmetric flow. For chemical portion of problem, equilibrium state of gas at each point in computational grid determined by minimizing local Gibbs free energy, subject to local conservation of molecules, atoms, ions, and total enthalpy. Major advantage: resulting algorithm naturally stable and captures strong shocks without help of artificial-dissipation terms to damp out spurious numerical oscillations.

B89-10521

TAMPER-RESISTANT SECURE DISPOSAL CONTAINER

EARL R. COLLINS, JR. (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16639 Vol. 13, No. 10, P. 58

Closure device for secure waste containers prevents classified papers and other proprietary articles from being withdrawn when container turned on side. Has pendulum that swings comb into closed position when container turned on side. Suspended with axis of rotation perpendicular to axes of combs. Extends through D-shaped cam ring, attached to upper comb with standoff struts. When container tilted sideways, pendulum swings along arc side of D-shaped ring. Forces cam ring aside, moving upper comb toward closed position. If container tilted forward or backward, pendulum does not interfere with comb movement. Spring catches added to combs so if actuated and close container opening, they lock in place to prevent further tampering.

B89-10522

BEARING-BYPASS LOADING ON BOLTED COMPOSITE JOINTS

JOHN H. CREWS, and RAJIV-VIKAS A. NAIK (PRC Kentron, Inc.)
Oct. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-25437)

LAR-14106 Vol. 13, No. 10, P. 59

Unexpected interaction between effects of bypass and bearing loads reported. Combined experimental and analytical study described in NASA technical memorandum conducted to investigate effects of simultaneous bearing and bypass loading on graphite/epoxy laminate. Results important in emerging technology of composites for use in wide range of applications. Includes applications in aircraft, boats, and automobiles, in which bolted connections to composites increasingly important.

B89-10523

MATHEMATICAL MODELS OF TURBULENCE IN TRANSONIC FLOW

MORRIS W. RUBESIN, and JOHN R. VIEGAS

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12292 Vol. 13, No. 10, P. 59

Predictions of several models compared with measurements of well-documented flow. Report reviews performances of variety of mathematical models of turbulence in transonic flow. Predictions of models compared with measurements of flow in wind tunnel along outside of cylinder having axisymmetric bump of circular-arc cross section in meridional plane. Review part of continuing effort to calibrate and verify computer codes for prediction of transonic flows about airfoils. Johnson-and-King model proved superior in predicting transonic flow over bumpy cylinder.

B89-10524

ANALYSIS OF STRAIGHT AND WAVY ANNULAR SEALS

JOSEPH K. SCHARRER (Rockwell International Corp.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29584 Vol. 13, No. 10, P. 60

Rotordynamic coefficients derived. Report presents analysis of incompressible flow in annular turbopump seal with straight or radially/axially wavy (azimuthally symmetrical) surface facing shaft. Purpose of analysis to quantify effects of waviness on rotordynamic coefficients of seal. Whirl-frequency ratio of wavy rough seal considerably less than straight rough seal.

B89-10525

NUMERICAL SIMULATION OF TURBINE ROTOR/STATOR INTERACTION

MAN MOHAN RAI, and NATERI K. MADAVAN (Sterling Federal Systems)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12293 Vol. 13, No. 10, P. 61

Report describes numerical simulation of time-varying flows around multiple rotor and stator airfoils in turbine. Conducted with help of new computer program simulating flow in turbine stage configured with unequal numbers of rotor and stator airfoils. Based on thin-layer Navier-Stokes equations of unsteady, two-dimensional flow. Studies like this one helpful in improving performance obtainable from various turbine designs and in studying unsteady effects - for example, unsteady loads on airfoils.

B89-10526

R-CURVE INSTABILITY CALCULATIONS OF CRACK GROWTH

THOMAS W. ORANGE

Oct. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-23278)

LEW-14841

Vol. 13, No. 10, P. 62

Report discusses use of instability method of calculation and R-curve mathematical models to analyze growth of cracks in fracture-mechanics specimens. In case of single material and structure, such analysis sometimes simple enough to be done on pocket calculator. Where microcomputer or larger computer available, comprehensive program includes libraries of driving-force equations for various configurations and R-curve mathematical models for different materials. Author concludes instability method simple and effective and model equations studied all viable in sense at least one of them should fit almost any applicable set of crack-growth data. Method and models constitute powerful mathematical tools for analysis of fractures.

B89-10527

USING NASTRAN TO ANALYZE VIBRATIONS OF ROTOR BLADES

CHARLES LAWRENCE, ROBERT A. AIELLO, MICHAEL A. ERNST, and OLIVER G. MCGEE (Ohio State Univ.)

Oct. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-21375)

LEW-14799

Vol. 13, No. 10, P. 62

Report gives information on use of NASTRAN computer program in finite-element analysis of rotating flexible blades like in compressors and on turboprop engines. Predicts steady-state components of deflections and stresses under centrifugal forces, generates data for plots of natural frequency versus rotational speed, and provides vibration-mode data for calculations of flutter. Describes use of NASTRAN solution sequence 64 for geometrical nonlinear analysis and solution sequence 63 for determination of frequencies and vibrational-mode shapes. Includes sample problem with NASTRAN input data. Emphasizes key factors in analysis of rotating blades, such as setting angle and centrifugal softening effects. Combined analyses of solution sequences 64 and 63 reduces computer time and number of output listings, in comparison with separate analyses. In central-processing-unit time cut in half.

B89-10563

MOUNTS FOR SELECTIVE ROTATION AND TRANSLATION

EARL R. COLLINS, JR. (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17686

Vol. 13, No. 11, P. 58

Blade-in-groove bearings stacked to obtain necessary degrees of freedom. Mounting system allows panels to be tilted, rotated, and translated selectively. Developed for large solar reflectors or antennas composed of hexagonal panels about 6 ft. wide and 6 in. thick. With system, each panel tilted around two axes to focus antenna. At same time, each panel translates along these axes to accommodate thermal expansion and contraction without affecting focus.

B89-10564

COOLING SHELF FOR ELECTRONIC EQUIPMENT

HERBERT J. TANZER (Hughes Aircraft Co.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13956

Vol. 13, No. 11, P. 59

Heat-pipe action cools and maintains electronics at nearly constant temperature. System designed to control temperatures of spacecraft shelves or baseplates by combining honeycomb sandwich panel with reservoir of noncondensable gas and processing resulting device as variable-conductance heat pipe. Device provides flat surface for mounting heat-dissipating electronics that is effectively cooled and maintained at nearly

constant temperature. Potentially useful in freeze drying, refrigeration, and air conditioning.

B89-10565

HINGED, MAGNETIC HOLDER FOR RADIOGRAPHIC FILM

DARRYL E. PIERCE (Rockwell International Corp.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29366

Vol. 13, No. 11, P. 60

Hinged holder equipped with magnets enables positive, accurate, and repeatable placement and orientation of radiographic film at hidden and otherwise inaccessible location. Made from simple, readily available parts. Film and holder inserted in end of duct and pulled along by magnets on outside. Holder removed by reversing sequence of motions.

B89-10613

SYSTEMS IMPROVED NUMERICAL DIFFERENCING ANALYZER (SINDA)

R. A. VOGT

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-13805 MSC-20448

Vol. 13, No. 12, P. 48

SINDA '85/FLUINT handles complex problems involving pumps, valves, heat exchangers, and resistor-capacitor networks. When combining SINDA with another classic program, TRASYS II, users tackle thermal radiation problems, including shadowing by opaque or semitransparent surfaces. Utility programs automatically convert SINDA/TRASYS output to form compatible with NASTRAN-developed structures.

B89-10615

NASA STRUCTURAL ANALYSIS SYSTEM (NASTRAN)

R. L. BRUGH (COSMIC)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

HQN-10952

Vol. 13, No. 12, P. 48

NASTRAN used to design products ranging from aircraft to automobiles to printers. In addition to DEC VAX, IBM, CDC, and UNIVAC machine versions, NASTRAN available for MicroVAX under VMS and UNIX. COSMIC generates new release of NASTRAN each year.

B89-10621

MULTIPLE-CANTILEVER TORQUE SENSOR

BORIS J. LURIE (Caltech), J. ALAN SCHIER (Caltech), and MICHAEL SOCHA (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17461

Vol. 13, No. 12, P. 50

Sensitivity to spurious loads small. High stiffness, high resolution, and ease of fabrication among features of specially designed torque sensor. Device flexible and sensitive to torque about its cylindrical axis and stiff enough to be insensitive to bending about any perpendicular axis. Measures and transmits torque between driving and driven plates.

B89-10622

COMPLIANT PROSTHETIC OR ROBOTIC JOINT

JAMES J. KERLEY, and WAYNE D. EKLUND (NSI Technology Services Corp.)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

GSC-13153**Vol. 13, No. 12, P. 51**

Rotation partly free and partly restrained by resilience and damping. Joint includes U-shaped x- and y-axis frames joined by cables that cross in at center piece. The y-axis frame rotates about y-axis on roller bearing within predetermined angular range. The y-axis frame rotates slightly farther when arm strikes stop, because cables can twist. This mimics compliant resistance of knee joint reaching limit of its forward or backward motion. Used in prosthetic device to replace diseased or damaged human joint, or in robot linkage to limit movement and cushion overloads.

B89-10623**HEAT EXCHANGER WITH RESERVOIR AND CONTROLS**

RICHARD F. BROWN (Grumman Aerospace Corp.), and FRED EDELSTEIN (Grumman Aerospace Corp.)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21295 MSC-21296**Vol. 13, No. 12, P. 51**

Heat-pipe assembly operates as evaporator or as condenser. New heat exchanger incorporates important improvements over previous designs. By adding reservoir to primary loop, locating ultrasonic liquid-level sensors on reservoir rather than directly on one of heat pipes, and revising control logic, uneven distribution of flow among heat pipes and erroneous behavior of valves eliminated.

B89-10624**COMPUTATION OF FLOW ABOUT A HELICOPTER ROTOR**

C. L. CHEN, and W. J. MCCROSKEY

Dec. 1989 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A88-22031)

ARC-12227**Vol. 13, No. 12, P. 53**

Improved method developed to simulate numerically flow about helicopter rotor with multiple blades. Computes vortical wake beneath rotor without using simplified ad hoc mathematical models of effects in wake. Patched grids used in numerical simulation of flow about rotor blades. Cylindrical configuration simplifies interpolation at interface between rotating and stationary grids.

B89-10625**TENSIL FILM CLAMPS AND MOUNTING BLOCK FOR VISCOELASTOMETERS**

DIANE M. STOAKLEY, ANNE K. ST. CLAIR, and BRUCE D. LITTLE

Dec. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13696**Vol. 13, No. 12, P. 54**

Set of clamps and mounting block developed for use in determining tensile moduli and damping properties of films in manually operated or automated commercial viscoelastometer. These clamps and block provide uniformity of sample gripping and alignment in instrument. Dependence on operator and variability of data greatly reduced.

B90-10020**POST CLAMP WITH ATTACHED COLLAR**

JOHN KARL RAMSEY, and ERWIN H. MEYN

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14862**Vol. 14, No. 1, P. 48**

New clamp for optical posts reduces time required to set up optical components. Joins pair of perpendicular posts supporting laser, lens, reflector, or other optical component and enables posts to be rotated in perpendicular planes so orientation and position

of component adjusted. Advantage of clamp conferred by its E-type retaining rings, which hold post-clamp collars to post-clamp body. Collar tightens around post to prevent movement along post while allowing clamp to turn around post. Quarter-turn screws on body and collars tighten parts on post. Does not tend to mar post.

B90-10021**MEASURING DIAMETERS OF LARGE VESSELS**

JAMES R. CURRIE, RALPH R. KISSEL, CHARLES E. OLIVER, EARNEST C. SMITH, JOHN W. REDMON, SR., CHARLES C. WALLACE, and CHARLES P. SWANSON

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28287**Vol. 14, No. 1, P. 53**

Computerized apparatus produces accurate results quickly. Apparatus measures diameter of tank or other large cylindrical vessel, without prior knowledge of exact location of cylindrical axis. Produces plot of inner circumference, estimate of true center of vessel, data on radius, diameter of best-fit circle, and negative and positive deviations of radius from circle at closely spaced points on circumference. Eliminates need for time-consuming and error-prone manual measurements.

B90-10022**USING RUBY BALLS AS FIDUCIAL MARKS**

NANCE M. PAINTER (Rockwell International Corp.)

Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29394**Vol. 14, No. 1, P. 54**

Combination of basic and advanced techniques yields new capability for inspection. In new technique, surface first inspected with fluorescent penetrant dye to reveal flaws. Ruby ball of known diameter placed near flaw having to be measured. Flaw and ball observed through magnifying video system that can 'freeze' image.

B90-10023**IMPROVED COUPLED FLUID/STRUCTURAL DYNAMICAL MODEL**

JAMES R. FENWICK (Rockwell International Corp.)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29439**Vol. 14, No. 1, P. 54**

Improved algorithm developed for simulation of coupled motions of fluids and structures. Minimum requirement for correct simulation of damping is forces and velocities at interface compatible in models of structure and fluid at each time step. Improved algorithm, conforms to this requirement, involves fluid-transient model, structural modal/transient model, and an algebraic impedance/coupling subalgorithm. Use of this algorithm greatly improves computational stability.

B90-10024**PREDICTING PRESSURE DROP IN POROUS MATERIALS**

PIERCE L. LAWING

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14105**Vol. 14, No. 1, P. 56**

Theory developed to predict drop in pressure based on drag of individual fibers. Simple correlation method for data also developed. Helps in predicting flow characteristics of many strain-isolation pad (SIP) glow geometries in Shuttle Orbiter tile system. Also helps in predicting venting characteristics of tile assemblies during ascent and leakage of hot gas under tiles during descent. Useful in study of mechanics of flows through fibrous

and porous media, and procedures applicable to purged fiberglass insulation, dialysis filters, and other fibrous and porous media.

B90-10025**DETERMINING SPATIAL COORDINATES BY LASER RANGING**
LARRY L. SCHUMACHER (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17436**Vol. 14, No. 1, P. 57**

Three range-measuring lasers arranged in triangle measure location of point. Set of three measurements of distances (ranges) of retroreflector on object from three rangefinders provides sufficient information to calculate coordinates of retroreflector in coordinate system defined by rangefinders. If at least three noncollinear retroreflectors attached to object, orientation of object also determined. Potential applications include observation and control of large structures, robotics, and machine vision.

B90-10026**MORE ABOUT MULTIPLE-BOUNDARY-CONDITION TESTING**

CHIN-PO KUO (Caltech), and BEN K. WADA (Caltech)
Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17574**Vol. 14, No. 1, P. 58**

Measured shapes of vibrational modes used to update mathematical models. Report extends discussion of multiple-boundary-condition vibrational testing techniques. Emphasis on further refinement of mathematical model by use of differences between measured eigenvectors and eigenvectors predicted by model to be refined.

B90-10027**COMPUTATIONAL FLUID DYNAMICS FOR HELICOPTERS**

F. X. CARADONNA, and W. J. MCCROSKEY
Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12143**Vol. 14, No. 1, P. 59**

Powerful computer codes undergoing development. Report reviews development of computational fluid dynamics (CFD) for prediction of airflow around rotary wings of helicopters. Reviews progress in following endeavors: Prediction and verification of flows under various operating conditions; calculation of interactions between rotor blades and vortexes; analysis of viscous, transonic flows about airfoils; and study of formation of vortexes at tips of rotors.

B90-10065**SIMULATING ORBITING SPACECRAFT**

J. M. STECKLEIN (Lockheed Engineering and Management Service Co., Inc.), C. PLOWMAN (Lockheed Engineering and Management Service Co., Inc.), A. LEWIS (Lockheed Engineering and Management Service Co., Inc.), B. DRAKE (Lockheed Engineering and Management Service Co., Inc.), and K. LEAHY (Lockheed Engineering and Management Service Co., Inc.)
Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21462**Vol. 14, No. 2, P. 49**

SPASIS is computer program for simulation of orbits around Earth in six degrees of freedom. Developed to investigate orbital dynamics of spacecraft designed by users. SPASIS is user-friendly, menu-driven program and contains many features relevant to current and advanced space systems. During each orbit assortment of data available for output, all under control of user. Written entirely in FORTRAN 77.

B90-10066**TWO-FAULT-TOLERANT RELEASE MECHANISM**

THOMAS J. GRAVES, and ROBERT A. YANG
Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21354**Vol. 14, No. 2, P. 50**

Remotely-operated, compact quick-release mechanism still functions in event that one or even two attempts to actuate it fail. Contains three independent pyrotechnic devices. Firing of any one of devices sufficient to actuate mechanism. Three pins hold toggle at its base. Retraction of any one of pins allows toggle head to rotate in spherical bearing to free itself from remaining pin or pins. Besides allowing rotation after retraction, bearing also aligns toggle during assembly.

B90-10067**PRESSURE GAUGES MONITOR LEAKAGE PAST SEALS**

STEVEN A. SMITH (Boeing Aerospace Co.)
Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21385**Vol. 14, No. 2, P. 50**

Method devised to measure leakage of gas past each of two sets of primary and secondary seals into common volume from which aggregate flow measured. Although method applicable only to specific combination of flow configuration and thermal conditions, it serves as example of more general approach involving use of statistical analysis to extract additional information from measurements.

B90-10068**INTERFEROMETRIC MEASUREMENT OF RESIDUAL STRESS**

STEVEN DANYLUK (Illinois Univ., Chicago), and A. T. ANDONIAN (Illinois Univ., Chicago)
Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17440**Vol. 14, No. 2, P. 51**

Stress averaged through thickness of plate measured nondestructively. Theory of elasticity combined with laser interferometric technique into technique for measurement of residual stresses in solid objects - usually in thin, nominally-flat plates. Measurements particularly useful in inspection of wafers of single-crystal silicon for making solar cells or integrated circuits, because stresses remaining after crystal-growing process cause buckling or fracture. Used to predict deflections of plates caused by known applied loads under specified boundary condition, or to infer applied loads that cause known deflections. Also used to relate known deflections to residual stresses equivalent to stresses produced by fictitious applied loads.

B90-10069**MEASURING GAPS IN O-RING SEALS**

SCOTT E. JOHNSON (Morton Thiokol, Inc.)
Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28332**Vol. 14, No. 2, P. 52**

Technique enables measurement of leakage areas created by small obstructions in O-ring seals. With simple fixture, gaps measured directly. Compresses piece of O-ring by amount determined by spacers. Camera aimed through clear plastic top plate records depression made in O-ring by obstruction. Faster, easier, more accurate than conventional estimation.

B90-10070**SHAPE GAUGE MEASURES SURFACES**

RALPH C. VEALE, W. TYLER ESTLER, and THOMAS CHARLTON, JR.

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28284 Vol. 14, No. 2, P. 52

Tedious measurements and calculations performed quickly and accurately. Optical/mechanical/electronic system acts as shape gauge by taking measurements of machine-tool motions or complicated contours of objects, then processing measurement data into maps or profiles indicative of shapes. Transducers of shape gauge mechanical/electronic or optomechanical/electronic components that move along path on surface and measure roundness, perpendicular deviation, or slope of surface. Because of ease and speed, many intersecting profiles measured on surface.

B90-10071

VISUAL-INSPECTION PROBE FOR CRYOGENIC CHAMBER
STEVE FRIEND (Parker Hannifin Corp.), JAMES VALENZUELA (Parker Hannifin Corp.), and JAY YOSHINAGA (Parker Hannifin Corp.)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21444 Vol. 14, No. 2, P. 53

Visual-inspection probe that resembles borescope enables observer at ambient temperature to view objects immersed in turbulent flow of liquid oxygen, liquid nitrogen, or other cryogenic fluid. Design of probe fairly conventional, except special consideration given to selection of materials and to thermal expansion to provide for expected range of operating temperatures. Penetrates wall of cryogenic chamber to provide view of interior. Similar probe illuminates scene. View displayed on video monitor.

B90-10072

PERPENDICULAR-FORCE LATCH

JOHN P. MATTEI (Rockwell International Corp.), PETER A. BUCK (Rockwell International Corp.), and MICHAEL D. WILLIAMS (Rockwell International Corp.)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21406 Vol. 14, No. 2, P. 54

Latching mechanism simultaneously applies force in two perpendicular directions to install or remove electronic-equipment modules. Used to simplify installation and removal of modular equipment where movement restricted by protective clothing as in hazardous environments or where installation and removal to be performed by robots or remote manipulators. Concept adaptable to hydraulic, pneumatic, and mechanical systems.

B90-10110

JIG FOR STEREOSCOPIC PHOTOGRAPHY

DAVID J. NIELSEN (Rockwell International Corp.)

Mar. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21397 Vol. 14, No. 3, P. 70

Separations between views adjusted precisely for best results. Simple jig adjusted to set precisely, distance between right and left positions of camera used to make stereoscopic photographs. Camera slides in slot between extreme positions, where it takes stereoscopic pictures. Distance between extreme positions set reproducibly with micrometer. In view of trend toward very-large-scale integration of electronic circuits, training method and jig used to make training photographs useful to many companies to reduce cost of training manufacturing personnel.

B90-10111

STATIC PRESSURE-ASSISTED SEAL FOR HELIUM

DONALD E. STUCK (Rockwell International Corp.), and TAKATERU OKABAYASHI (Rockwell International Corp.)

Mar. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29429 Vol. 14, No. 3, P. 70

Two-piece, all-metal, pressure-assisted static flange seal holds in pressurized helium satisfactorily at temperature of negative 80 degree F (negative 62 degree C). Installed between two flanges, then bolted together. New version includes one pressure-assisted metal sealing element held in place by metal plate and flanges. Certified for use in flight on helium joints of Space Shuttle main engine. Likely terrestrial applications include laboratory and industrial gas-distribution systems.

B90-10112

LIQUID-FLOW CONTROLLER RESPONDS TO PRESSURE

GEORGE B. COX, JR. (United Technologies Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28329 Vol. 14, No. 3, P. 72

Mechanism controls flow of liquid in fuel-spraying head in combustion chamber responds nonlinearly to pressure of liquid. Shell of spraybar expands or contracts laterally as its internal pressure rises or falls, forcing collar down or up on entry tube. Area of window formed by slots in collar and entry tube thus increases or decreases. Drop in pressure through variable-area orifice increases much more with flow through orifice than does corresponding drop in pressure with flow through fixed-area orifice. In practical terms, lower pump pressure needed with variable orifice for given flow of liquid. Principle of operation applicable to spraying heads for other fluids.

B90-10113

LIQUID-FLOW CONTROLLER WITH PRESET BREAK PRESSURE

GEORGE B. COX, JR. (United Technologies Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28330 Vol. 14, No. 3, P. 73

Spraybar mechanism delivers liquid at rate that increases gradually with pressure of liquid, once pressure has exceeded minimum value. Alternative version of one described in article, 'Liquid-Flow Controller Responds To Pressure' (MFS-28329). Orifice in shell rises on lower end of pintle as pressure in shell increases. Gap forms between pintle and orifice only after pressure reaches certain minimum value. Liquid then begins to flow out from cavity in shell. Once minimum pressure for flow reached, pressure increases gradually with increasing flow. This contrasts with behavior of fluid in fixed-area orifice, wherein pressure increases steeply with flow.

B90-10114

LIQUID-FLOW CONTROLLER WITH TRICKLE PREFLOW

GEORGE B. COX, JR. (United Technologies Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28331 Vol. 14, No. 3, P. 74

Liquid-flow controller allows pressure in liquid to increase steeply with flow as flow starts, then provides more-gradual nearly linear rise of pressure with flow as flow and pressure increase beyond preset breakpoint. Controller alternative version of mechanism described in 'Liquid-Flow Controller Responds To Pressure' (MFS-28329) and 'Liquid-Flow Controller With Preset Break Pressure' (MFS-28330). Material cut out of cone at tip of pintle. Liquid always passes from shell, albeit at low rate. When pressure

in shell great enough to force orifice away from pintle, liquid flows at greater rate.

B90-10115

FOURIER ANALYSIS OF VIBRATIONS OF ROUND STRUCTURES

GARY A. DAVIS (Rockwell International Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29334

Vol. 14, No. 3, P. 74

Fourier-series representation developed for analysis of vibrations in complicated, round structures like turbopump impellers. Method eliminates guesswork involved in characterization of shapes of vibrational modes. Easy way to characterize complicated modes, leading to determination of responsiveness of given mode to various forcing functions. Used in conjunction with finite-element numerical simulation of vibrational modes of structure.

B90-10116

DETECTING BOUNDARY-LAYER TRANSITION IN COLD ENVIRONMENTS

C. B. JOHNSON, D. L. CARRAWAY, P. C. STAINBACK, and M. F. FANCHER (Douglas Aircraft Co., Inc.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13830

Vol. 14, No. 3, P. 76

Transition-detection study conducted in Langley 0.3-Meter Transonic Cryogenic Tunnel, using specialized hot-film system designed specifically for use in cryogenic wind tunnels. Quantitative transition-location data obtained at nearly cryogenic conditions, 360 degree R (200 K) represents first definitive transition Reynolds numbers obtained in cryogenic wind tunnel. Multichannel data-acquisition system processes data from 40 hot-film sensors by use of desktop computer. Concept enables on-line determination of boundary-layer transition in such cryogenic wind tunnels as National Transonic Facility.

B90-10117

ELECTROLYSIS BUBBLES MAKE WATERFLOW VISIBLE

DONALD F. SCHULTZ

Mar. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14797

Vol. 14, No. 3, P. 76

Technique for visualization of three-dimensional flow uses tiny tracer bubbles of hydrogen and oxygen made by electrolysis of water. Strobe-light photography used to capture flow patterns, yielding permanent record that is measured to obtain velocities of particles. Used to measure simulated mixing turbulence in proposed gas-turbine combustor and also used in other water-table flow tests.

B90-10118

ADAPTIVE-CONTROL EXPERIMENTS ON A LARGE FLEXIBLE STRUCTURE

CHE-HANG C. IH (Caltech), DAVID S. BAYARD (Caltech), SHYH J. WANG (Caltech), and DANIEL B. ELDRED (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17478

Vol. 14, No. 3, P. 78

Antennalike flexible structure built for research in advanced technology including suppression of vibrations and control of initial deflections. Structure instrumented with sensors and actuators connected to digital electronic control system, programmed with control algorithms to be tested. Particular attention in this research focused on direct model-reference adaptive-control algorithm based

on command generator tracker theory. Built to exhibit multiple vibrational modes, low modal frequencies, and low structural damping. Made three-dimensional so complicated interactions among components of structure and control system investigated.

B90-10119

VIBRATIONAL RESPONSES OF STRUCTURES TO IMPULSES

MICHAIL A. ZAK (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17343

Vol. 14, No. 3, P. 80

Report discusses propagation of vibrations in structure in response to impulsive and/or concentrated loads. Effects of pulsed loads treated by analyzing propagation of characteristic vibrational waves explicitly through each member of structure. This wave-front analysis used in combination with usual finite-element modal analysis to obtain more accurate representation of overall vibrational behavior.

B90-10120

ROLLING-CONTACT SPALLING IN BEARINGS

A. M. KUMAR (Vanderbilt Univ.), S. M. KULKARNI (Vanderbilt Univ.), B. BHARGAVA (Vanderbilt Univ.), G. T. HAHN (Vanderbilt Univ.), and C. A. RUBIN (Vanderbilt Univ.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27201

Vol. 14, No. 3, P. 81

Report describes experimental and theoretical studies of effects of thermal and mechanical contact stresses and attendant plastic deformations responsible for rolling-contact spalling of the 440C-steel bearings in high-pressure-oxygen turbopump.

B90-10121

INSULATION FOR CRYOGENIC-LIQUID TANKS

RICHARD H. KNOLL, PETER N. MACNEIL (General Dynamics Corp.), and JAMES E. ENGLAND (General Dynamics Corp.)

Mar. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23685)

LEW-14707

Vol. 14, No. 3, P. 82

Rigid foam and radiation shields prevent excessive heating in variety of environments. Report discusses design, development, and test of thermal-protection system for liquid-oxygen and liquid-hydrogen tanks of now discontinued Shuttle/Centaur G' project. System protects tank from excessive heat before and during launches, while in orbit around Earth, and during premature landings from aborted launches. Designed to withstand stresses of launch and emergency landing, acoustical loads, rapid changes in pressure, and impingement of rapidly flowing gas near vents of cargo bay in Space Shuttle. Primary requirements in design, system presents no hazard to Space Shuttle or its crew.

B90-10122

PERSPECTIVES ON DILUTION JET MIXING

J. D. HOLDEMAN, and R. SRINIVASAN (Garrett Turbine Engine Co.)

Mar. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-32432)'Perspectives in Dilution Jet Mixing'

LEW-14614

Vol. 14, No. 3, P. 83

NASA recently completed program of measurements and modeling of mixing of transverse jets with ducted crossflow, motivated by need to design or tailor temperature pattern at combustor exit in gas turbine engines. Objectives of program to identify dominant physical mechanisms governing mixing, extend empirical models to provide near-term predictive capability, and

06 MECHANICS

compare numerical code calculations with data to guide future analysis improvement efforts.

B90-10123

NUMERICAL ANALYSIS OF FLOWS WITH FIDAP

JEONG L. SOHN

Mar. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-10253)

MFS-27219

Vol. 14, No. 3, P. 84

Report presents an evaluation of accuracy of Fluid Dynamics Package (FIDAP) computer program. Finite-element code for analysis of flows of incompressible fluids and transfers of heat in multidimensional domains. Includes both available methods for treatment of spurious numerical coupling between simulated velocity and simulated pressure; namely, penalty method and mixed-interpolation method with variable choices of interpolation polynomials for velocity and pressure. Streamwise upwind (STU) method included as option for flows dominated by convection.

B90-10124

COMBINING THERMAL AND STRUCTURAL ANALYSES

STEVEN R. WINEGAR

Mar. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-27268)'SINDA-NASTRAN Interfacing Program Theoretical Description and User's Model'

LEW-14741

Vol. 14, No. 3, P. 84

Computer code makes programs compatible so stresses and deformations calculated. Paper describes computer code combining thermal analysis with structural analysis. Called SNIP (for SINDA-NASTRAN Interfacing Program), code provides interface between finite-difference thermal model of system and finite-element structural model when no node-to-element correlation between models. Eliminates much manual work in converting temperature results of SINDA (Systems Improved Numerical Differencing Analyzer) program into thermal loads for NASTRAN (NASA Structural Analysis) program. Used to analyze concentrating reflectors for solar generation of electric power. Large thermal and structural models needed to predict distortion of surface shapes, and SNIP saves considerable time and effort in combining models.

B90-10172

MEASURING CHANGES IN DIMENSIONS OF TURBINE BLADES

WILLIAM H. WOODFORD (Martin Marietta Corp.)

Apr. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28338

Vol. 14, No. 4, P. 60

Mechanical fixture and electronic gauge probe surface before and after fabrication processes. Assembly of commercially available devices measures changes in dimensions of irregularly shaped part. Turbine blade clamped on rotary table touched by probe of electronic depth gauge. Positioned by micrometers of three-axis translation stage, probe just touches blade. Assembly developed specifically to measure thickness of material added to or removed from surface of turbine blade during fabrication processes.

B90-10173

STEEL FOIL IMPROVES PERFORMANCE OF BLASTING CAPS

LAURENCE J. BEMENT, RONNIE PERRY (PRC Kentron), and MORRY L. SCHIMMEL (Schimmel Co.)

Apr. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13832

Vol. 14, No. 4, P. 60

Blasting caps, which commonly include deep-drawn aluminum cups, give significantly higher initiation performance by application of steel foils on output faces. Steel closures 0.005 in. (0.13 mm) thick more effective than aluminum. Caps with directly bonded

steel foil produce fragment velocities of 9,300 ft/s (2.8 km/s) with large craters and unpredictable patterns to such degree that no attempts made to initiate explosions. Useful in military and aerospace applications and in specialized industries as mining and exploration for oil.

B90-10174

FEEDER SYSTEM FOR PARTICLE-SIZE ANALYZER

KEITH E. RAMSEY (Morton Thiokol)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28326

Vol. 14, No. 4, P. 61

Feeder system meters precise stream of powder into precise flow of gas. Used to feed light-scattering particle-size analyzer that determines distribution of sizes of particles in powder. Dry analysis of powder takes about one-third time of conventional wet analysis and consumes less powder. Feed rate more precisely controllable, leading to more precision in analysis. In dry analysis, no need to dispose of hazardous liquid waste.

B90-10175

TRANSPORT OF PASSIVE SCALARS IN A TURBULENT CHANNEL FLOW

JOHN KIM, and PARVIZ MOIN

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12109

Vol. 14, No. 4, P. 62

Computer simulation of transport of passive scalars in turbulent channel flow described in report. Shows flow structures and statistical properties. As used here, 'passive scalars' means scalar quantities like fluctuations in temperature or concentrations of contaminants that do not disturb flow appreciably. Examples include transport of heat in heat exchangers, gas turbines, and nuclear reactors and dispersal of pollution in atmosphere.

B90-10232

INSPECTING THE FULL CIRCUMFERENCES OF TUBES

JOHN P. GEDDES (Rockwell International Corp.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29221

Vol. 14, No. 5, P. 64

Proposed tool for inspection of external welds on tube gives view of full circumferential strip of outer surface. Similar to borescopes used to inspect interiors of tubes. Instead of fitting inside tube, new tool encircles it. Inspection more reliable and less time consuming.

B90-10233

BORESCOPE WITH LARGE DEPTH OF FOCUS

KAMAL S. GUIRGUIS (Rockwell International Corp.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29461

Vol. 14, No. 5, P. 64

Modification of commercial borescope yields clear, glare-free images of defects on inside of tube. Used to examine diverging wall of tube. Wall illuminated by light from fiber distinct from fused-fiber cable used for viewing. Viewing cable holds right-angle mirror at tip so it can look sideways. Image appears, magnified, on monitor. Instrument offers large depth of focus and therefore used in tubes of varying inside diameter.

B90-10234

MULTIPLE-INLET/SINGLE-OUTLET ORIFICE PLATE

ROBERT L. GODOWN (Rockwell International Corp.)

May 1990 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29407

Vol. 14, No. 5, P. 67

Orifice plate for control of flow has multiple slanted inlets leading to single outlet. Multiple-inlet/single-outlet orifice less susceptible to blockage than single hole drilled through plate perpendicular to its surface. Easily calibrated for various flow rates and fits in place of simple orifice plate with no other modifications.

B90-10235

THERMAL-TRANSIENT TESTING OF TURBINE BLADES

WILLIAM R. WAGNER (Rockwell International Corp.), and LOUIS H. PIDCOKE (Rockwell International Corp.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29416

Vol. 14, No. 5, P. 68

Testing apparatus applies pulses of heat to turbine blade to determine resistance to thermal fatigue. Uses nonintrusive inductive heating and records distribution of temperature on blade with infrared video camera. Allows precise control of heating and cooling. Designed for testing blades used in advanced high-pressure, high-temperature turbines.

B90-10236

IMPROVED HUB FAIRINGS FOR HELICOPTERS

ROBERT H. STROUB, LARRY A. YOUNG, DAVID R. GRAHAM, and ALEXANDER W. LOUIE

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12288

Vol. 14, No. 5, P. 69

Wind-tunnel experiments show new generic configuration for fairing for helicopter rotor hub reduces contribution of hub to overall aerodynamic drag. New generic fairing has flat bottom, which eliminates converging/diverging boundary by straightening surfaces facing each other. Reduces interference drag, similarly to reduction of interference drag by flattening of facing surfaces of two side-by-side airfoils.

B90-10237

COMPLIANT JOINTS FOR ROBOTS

JAMES J. KERLEY, JR.

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13127

Vol. 14, No. 5, P. 70

Compliant joints devised to accommodate misalignments of tools and/or workpieces with respect to robotic manipulators. Has characteristics and appearance of both universal-joint and cable-spring-type flexible shaft coupling. Compliance derived from elastic properties of short pieces of cable. Compliance of joint determined by lengths, distances between, relative orientations, thickness of strands, number of strands, material, amount of pretwist, and number of short pieces of cable. Worm-drive mechanism used to adjust lengths to vary compliance as needed during operation.

B90-10238

FIXED-POSITION ISOLATION VALVE

FRANK S. MCKULLA (RCA Corp.), LOUIS V. LEONARDI (RCA Corp.), and SIU CHUN (RCA Corp.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17707

Vol. 14, No. 5, P. 71

Connection box and mating plugs constitute device to allow or block flow of fluid. Device acts as isolation valve in sense set in open or closed configuration. Not strictly valve in sense

configuration cannot be changed during operation without spilling fluid. Intended for use where changes between open and closed configurations meant to be infrequent. Principle virtues of device are its light weight and compactness.

B90-10239

CHARACTERISTIC-WAVE APPROACH COMPLEMENTS MODAL ANALYSIS

MICHAEL ZAK (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17741

Vol. 14, No. 5, P. 72

Aspects of estimation of unmodeled dynamics discussed. Report discusses solution of nonhomogeneous governing matrix equation for dynamics of short vibrational pulses propagating as characteristic waves in large structure. Applied to analyze response, to repeated pulses, of beam clamped at one end and free at other. Shows all qualitative characteristics occurring under arbitrary periodic excitations of beam and those of quasi-periodic excitations, in as much as such excitations obtained by linear superpositions of periodic excitations.

B90-10240

UPWIND ALGORITHM FOR PARABOLIZED NAVIER-STOKES EQUATIONS

SCOTT L. LAWRENCE, DENNY S. CHAUSSEE, and JOHN C. TANNEHILL (Iowa Univ.)

May 1990 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A87-42061)

ARC-12146

Vol. 14, No. 5, P. 73

Supersonic flow about cone calculated accurately. Report presents theoretical basis of computer code solving parabolized Navier-Stokes equations of supersonic and hypersonic flow. For increased accuracy in resolution of details of strong aerodynamic shocks, code incorporates implicit, finite-volume, upwind numerical-integration scheme. Performs well in numerical simulations of flows around simple bodies.

B90-10289

CRASH-RESISTANT SHIELD

CHARLES H. BIXLER (General Electric Co.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17616

Vol. 14, No. 6, P. 71

Impact-resistant shield designed to consist of aluminum honeycomb structure sandwiched between inner and outer aluminum skins. Intended to protect radioisotope thermoelectric generator of spacecraft from impact with ground or water after free fall from upper atmosphere. Designed to absorb impact energy by buckling, while inner and outer skins designed to protect against shrapnel, overpressure, and impact loads. Concept of shield applicable to crashproof compartments for ground vehicles and aircraft.

B90-10290

COMBINATION OF TECHNIQUES FOR COMPUTING INCOMPRESSIBLE FLOW

D. KWAK, and S. E. ROGERS (Sterling Software)

Jun. 1990 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A88-40752)

ARC-12257

Vol. 14, No. 6, P. 71

Pseudocompressibility, upwind differencing, and other techniques used to solve Navier-Stokes equations. Scheme for finite-difference numerical solution of two-dimensional

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Navier-Stokes equations of incompressible flow combines several recently developed methods, each developed to increase speed and/or accuracy of computations of this kind.

B90-10291

RADIAL CRACKS WOULD SIGNAL WEAROUT OF TURBINE BLADES

DONALD E. PAULUS (United Technologies Corp.)

Jun. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28363

Vol. 14, No. 6, P. 72

Nonfatal defects made to appear before fatal ones. Proposed to design turbine blades to crack radially before they crack chordwise. Advance radial cracking promoted in design by adjusting thermal stresses and net bending stresses. Prior appearance of radial crack or cracks in used blade serves as warning that more-threatening chordwise crack or cracks may subsequently appear. Blade replaced before it fails.

B90-10292

NUMERICAL SIMULATION OF BUCKLING IN WAFFLE PLANTS

DAH N. YIN (Rockwell International Corp.), and VU M. TRAN (Rockwell International Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21599

Vol. 14, No. 6, P. 72

Accurate results obtained when fillet radii considered. Two reports describe numerical and experimental study of application of PASCO and WAFFLE computer programs to analysis of buckling in integrally machined, biaxially stiffened panel. PASCO (Panel Analysis and Sizing Code) is finite-element stress-and-strain code written for analysis and sizing of uniaxially stiffened panels. WAFFLE program provides comprehensive stress analysis of waffle panel, used to determine bending moments at interfaces.

B90-10293

AEROTHERMODYNAMIC HEATING OF A TRANSATMOSPHERIC VEHICLE

MICHAEL E. TAUBER, and HENRY G. ADELMAN

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11854

Vol. 14, No. 6, P. 74

Vehicle heated more severely during ascent than during descent. Report describes calculations of aerothermodynamic heating of conceptual transatmospheric vehicle (vehicle with characteristics of both airplane and space shuttle, intended to take off and land at ordinary airports and to fly along trajectories taking it briefly into low orbits above atmosphere). Calculations important to future design studies to determine need for cooling by transpiration or ablation of most-severely heated surfaces.

B90-10353

SILICON NITRIDE BALLS FOR CRYOGENIC BEARINGS

MYLES F. BUTNER (Rockwell International Corp.), and LILLIAN W. NG (Rockwell International Corp.)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29613

Vol. 14, No. 7, P. 63

Resistance to wear greater than that of 440C steel. Experiments show lives of ball bearings immersed in liquid nitrogen or liquid oxygen increased significantly when 440C steel balls (running on 440C steel races) replaced by balls of silicon nitride. Developed for use at high temperatures, where lubrication poor or nonexistent. Best wear life of any bearing tested to date and ball material

spalls without fracturing. Plans for future tests call for use of liquid oxygen as working fluid.

B90-10354

IMPROVED INSERT FOR VARIABLE MACH NUMBER

RICHARD L. PUSTER

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13548

Vol. 14, No. 7, P. 63

Nozzle insert lowers wind-tunnel mach number while maintaining excellent flow quality. Essential components of improved design include sonic first throat, expansion surface, variable boundary-layer bleed, insert itself, and existing, unchanged, contour of nozzle. Modification involves creation of secondary throat and critical addition of boundary-layer bleed path between insert and original tunnel wall. Enables quick change of mach number in existing facility at relatively low cost and requires no special contouring of existing nozzle. Represents simple and cost-effective method of altering mach number in any supersonic wind tunnel.

B90-10355

DOUBLE-SWIVEL MECHANISM FOR RELIABLE RELEASE

GUY L. KING, and WILLIAM C. SCHNEIDER

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21436

Vol. 14, No. 7, P. 64

Double-swivel toggle mechanism releases large, heavy objects reliably. Double-swiveling action of mechanism ensures it clears restraining pins upon release. Pins retain toggle and its load. If pin fails to withdraw at designated time for releasing payload, toggle swivels about its upper ball, and ring swivels about lower ball so ring flange clears failed pin. Double-swivel action ensures disengagement even if two pins fail to withdraw.

B90-10356

SIMULATION OF UNSTEADY, VISCOUS, INCOMPRESSIBLE FLOW

MOSHE ROSENFELD, and DOCHAN KWAK

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-30085) 'Numerical Simulation Of Unsteady Incompressible Viscous Flows In Generalized Coordinate Systems'

ARC-12277

Vol. 14, No. 7, P. 67

Method for numerical solution of Navier-Stokes equations of viscous, incompressible flow developed based on use of fractional-step procedure. Accurate to second order in both space and time. Attempt made to minimize Poisson-equation difficulties by choosing pressures at centers and volume fluxes across faces of computational cells as dependent variables instead of familiar Cartesian components of velocity. Choice ensures satisfaction of discrete equation of conservation of mass to within round-off errors in any coordinate system and has favorable effects on convergence properties.

B90-10357

PRESSURIZED-FLAT-INTERFACE HEAT EXCHANGER

F. E. VOSS (LTV Aerospace and Defense Co.), H. R. HOWELL (LTV Aerospace and Defense Co.), and R. V. WINKLER (LTV Aerospace and Defense Co.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21271

Vol. 14, No. 7, P. 68

High thermal conductance obtained without leakage between loops. Heat-exchanger interface enables efficient transfer of heat between two working fluids without allowing fluids to intermingle. Interface thin, flat, and easy to integrate into thermal system. Possible application in chemical or pharmaceutical manufacturing

when even trace contamination of process stream with water or other coolant ruins product. Reduces costs when highly corrosive fluids must be cooled or heated.

B90-10358**JAM-RESISTANT CUTTERS FOR EMERGENCY SEPARATION**
ARTURO C. ORDONEZ (Rockwell International Corp.), and RONALD N. YEE (Rockwell International Corp.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21474**Vol. 14, No. 7, P. 68**

Pyrotechnic emergency-separation system includes shaped explosive charges that sever pair of hinges. System ensures reliable opening of escape hatch. Two pairs of cutters provided for each hinge so if one pair of cutters fails, other completes job. Pressure of explosions vented to prevent charge holders from fragmenting and forming sharp edges around open hatch. Exit slide deployed without tearing. Before detonation L-shaped retainers bear on hinge. After denotation, retainers fold outward to facilitate egress of severed hinges.

B90-10359**SAFE-EGRESS POLE FOR VEHICLE IN MOTION**

WINSTON D. GOODRICH, CLARENCE J. WESSELSKI, TIMOTHY E. PELISCHEK, BRUCE H. BECKER, JON KAHN, MARGARET E. GRIMALDI, JOHN MCMANAMEN, and EDGAR O. CASTRO

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21461**Vol. 14, No. 7, P. 72**

Telescoping pole helps people leave moving vehicle in emergency. Extends from vehicle far enough to guide people away from structural features that could strike and injure them. Also used to deliver cargo from aircraft without damage to or by wings or to eject supplies from moving trucks so they land off roadway. Concept developed to help crewmembers escape from Space Shuttle under certain flight conditions. Pole compact and lightweight.

B90-10360**SIMULATION OF TURBULENT, OSCILLATING BOUNDARY LAYER**

PHILIPPE R. SPALART, and BARRETT S. BALDWIN

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-24642)'Direct Simulation Of A Turbulent Oscillating Boundary Layer'

ARC-11858**Vol. 14, No. 7, P. 73**

Numerical results support predictions of simplified theories. Report discusses aspects of algebraic and numerical modeling of flow in infinite half space on one side of infinitely-large, flat plate, with sinusoidally oscillating free-stream velocity along one axis of plate. Flow has rich variety of behaviors, including strong gradients of pressure, points of inflection, and reversal.

B90-10361**SIMULATED HYPERSONIC FLOWS ABOUT A BLUNT BODY**

P. KUTLER, H. C. YEE, and G. H. KLOPFER (NEAR, Inc.)

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-22650)'Numerical Study Of Unsteady Viscous Hypersonic Blunt Body Flows With An Impinging Shock'

ARC-12251**Vol. 14, No. 7, P. 74**

Unsteady and steady flows compared. Report describes computer numerical study of two-dimensional, unsteady, viscous, hypersonic flows of air about blunt body with impinging shock. This kind of flow represents many practical phenomena; for example, interaction of fluctuating bow shock of hypersonic airplane

with shocks of leading edge of wing or of lip of cowl at inlet to engine. Such interactions give rise to complicated, moving shock-on-shock patterns.

B90-10362**PROPAGATION OF PULSE VIBRATIONS IN LARGE STRUCTURES**

MICHAIL ZAK (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17559**Vol. 14, No. 7, P. 74**

Study yields new insights into propagation of pulse-excited vibrations in large, complicated structures. Special attention paid to dispersion, damping, and trapping of pulses. Understanding of these effects help such endeavors as designing tall, thin buildings to resist high winds and earthquakes.

B90-10414**FLOW-CONTROL UNIT FOR NITROGEN AND HYDROGEN GASES**

B. J. CHANG (Life Systems, Inc.), and D. W. NOVAK (Life Systems, Inc.)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11772**Vol. 14, No. 8, P. 54**

Gas-flow-control unit installed and removed as one piece replaces system that included nine separately serviced components. Unit controls and monitors flows of nitrogen and hydrogen gases. Designed for connection via fluid-interface manifold plate, reducing number of mechanical fluid-interface connections from 18 to 1. Unit provides increasing reliability, safety, and ease of maintenance, and for reducing weight, volume, and power consumption.

B90-10415**FOUR-WHEEL VEHICLE SUSPENSION SYSTEM**

DONALD B. BICKLER (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17407**Vol. 14, No. 8, P. 55**

Four-wheel suspension system uses simple system of levers with no compliant components to provide three-point suspension of chassis of vehicle while maintaining four-point contact with uneven terrain. Provides stability against tipping of four-point rectangular base, without rocking contact to which rigid four-wheel frame susceptible. Similar to six-wheel suspension system described in 'Articulated Suspension Without Springs' (NPO-17354).

B90-10416**REDUCING AERODYNAMIC DRAG OF BLUFF BODIES**

LAWRENCE W. TAYLOR, JR., and BANDU N. PAMADI (Vigyan Research Associates, Inc.)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13768**Vol. 14, No. 8, P. 56**

New method found to reduce aerodynamic drag of noncircular bluff bodies like road-transport vehicles. Consists of installation of thin, flat panels on forward side of body, facing airstream. Produces streamlining effect over body. Width of wake reduced, and vortex shedding is greatly suppressed.

B90-10417
ULTRASONIC MONITOR TO DETERMINE CRACK-OPENING LOAD

WILLIAM T. YOST
 Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13889 Vol. 14, No. 8, P. 57

New ultrasonic monitor to determine crack-opening load in compact tension specimen uses transducers to pass acoustic wave across crack region. Definite improvement in signal-to-noise ratio. Process possesses substantial immunity from noise caused by operation of load frame and associated parts. In addition to applications for aerospace community, this monitor and concept clearly have general utility in testing of materials and potentially in nondestructive evaluation of solid parts.

B90-10418
PROBE MEASURES FOULING AS IN HEAT EXCHANGERS

WILBUR J. MARNER (Caltech), and KENTON S. MACDAVID (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17322 Vol. 14, No. 8, P. 58

Combustion deposits reduce transfer of heat. Instrument measures fouling like that on gas side of heat exchanger in direct-fired boiler or heat-recovery system. Heat-flux probe includes tube with embedded meter in outer shell. Combustion gases flow over probe, and fouling accumulates on it, just as fouling would on heat exchanger. Embedded heat-flow meter is sandwich structure in which thin Chromel layers and middle alloy form thermopile. Users determine when fouling approaches unacceptable levels so they schedule cleaning and avoid decreased transfer of heat and increased drop in pressure fouling causes. Avoids cost of premature, unnecessary maintenance.

B90-10469
FLEXIBLE ANIMATION COMPUTER PROGRAM

SCOTT S. STALLCUP (Computer Sciences Corp.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14102 Vol. 14, No. 9, P. 68

FLEXAN (Flexible Animation), computer program animating structural dynamics on Evans and Sutherland PS300-series graphics workstation with VAX/VMS host computer. Typical application is animation of spacecraft undergoing structural stresses caused by thermal and vibrational effects. Displays distortions in shape of spacecraft. Program displays single natural mode of vibration, mode history, or any general deformation of flexible structure. Written in FORTRAN 77.

B90-10470
SINDA '85/FLUINT, VERSION 2.2

BRENT CULLIMORE (Martin Marietta Corp.), RICHARD GOBLE (Martin Marietta Corp.), STEVEN RING (Martin Marietta Corp.), and CARL JENSEN (Martin Marietta Corp.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21528 Vol. 14, No. 9, P. 68

SINDA, Systems Improved Numerical Differencing Analyzer, software system developed for solving physical problems governed by diffusion-type equations modeled by lumped-parameter representations. Used as general thermal analyzer with resistor-and-capacitor-network representations, adapted to wide range of problems represented by such differential equations as Fourier, Poisson, or Laplace. Software system updated. FLUINT, FLUID INTEgrator, is advanced, one-dimensional fluid-analysis

program solving equations of arbitrary fluid-flow networks. Written in FORTRAN and ASSEMBLER.

B90-10471
OFFSET JOINT FOR SEGMENTED PRESSURE VESSEL

CARLETON J. MOORE

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28365 Vol. 14, No. 9, P. 70

Concept for increasing reliability of segmented pressure vessel proposed. Inward offset of tang and clevis bands of encircling joint between segments reduces or eliminates gap opening between tang and inner leg of clevis in response to pressure in vessel.

B90-10472
MEASUREMENT OF WATER SPRAYS GENERATED BY AIRPLANE TIRES

ROBERT H. DAUGHERTY, and SANDY M. STUBBS

Sep. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-24458) 'Measurements of Flow Rate and Trajectory of Aircraft Tire-Generated Water Spray.'

LAR-14030 Vol. 14, No. 9, P. 70

Experimental investigation conducted at NASA Langley Research Center to measure rate of flow and trajectory of water spray generated by tire operating on flooded runway. Potential application to both aircraft and automotive industries, with particular application to manufacturers of tires.

B90-10473
PRECISE HINGE HAS LOW FRICTION

EARL R. COLLINS, JR. (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17749 Vol. 14, No. 9, P. 71

Precise hinge rotates with minimal friction and without 'slop'. Axis of rotation at central axis of concentric, self-retaining assembly. Blades in same plane, and both edges of blades and apexes of grooves lie along same line, allowing free rotation without either binding or slop. Blades on rotor engage grooves on stator. Blades pivot about edges through arc defined by slotted openings in stator housing.

B90-10474
SIMULATING A MASSIVE, MOBILE STRUCTURE

PETER M. FANTASIA, JON B. KAHN, and BENNY B. SPRAGUE

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21482 Vol. 14, No. 9, P. 72

Simulator replicates, kinematically and dynamically, mating of large, massive mobile structure with similarly large and massive fixed structure. Developed for testing berthing-and-latching mechanism. Fixed section holds active berthing-and-latching mechanism and its motor control system with optical encoder to maintain synchronization among four latches in mechanism. Tripodal load-cell network gathers data on load history of berthing operation, and infrared tracking system including light-emitting diodes produces data for position history.

B90-10475
DISSIPATION OF ENERGY IN EXTENSION OF CRACKS

KUNIGAL N. SHIVAKUMAR (Analytical Services and Materials, Inc.), and JOHN H. CREWS, JR.

Sep. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17090) 'Energy

Dissipation Associated With Crack Extension in an Elastic-Plastic Material.'

LAR-14025

Vol. 14, No. 9, P. 73

Dissipation in elastic-plastic material calculated by two-dimensional finite-element method. Analytical procedure developed to calculate various components of dissipation of energy during extension of crack and to relate them to total dissipation of energy computed from global load-displacement response. Observations in study valid for other elastic-plastic fracture situations, including growth of cracks in pressure vessels in nuclear powerplants.

B90-10476

RADIAL PROFILOMETRY

J. A. GILBERT (Alabama Univ.), P. GREGUSS (Alabama Univ.), and D. R. MATTHYS (Alabama Univ.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26101

Vol. 14, No. 9, P. 74

Radial profilometry is combination of optical and electronic techniques for measurement of inner surfaces of cylindrical or nearly cylindrical cavities. Profilometer inserted in pipe or other cavity to measure its shape optically. Illumination supplied through optical fiber, and image of inspected area of cavity transmitted through bundle of optical fibers. Applications include inspection of pipes, tubes, boreholes, and possibly measurements of contours in blood vessels or other internal organs.

B90-10477

REDUNDANT, CONFINED-EXPLOSIVE SEVERANCE DEVICE

LAURENCE J. BEMENT, and MORRY L. SCHIMMEL (Schimmel Co.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13582

Vol. 14, No. 9, P. 75

Noncontaminating, long, explosive joint with highly reliable separation capability invented for such applications as separation of rocket-motor stages of spacecraft from rockets or Space Shuttle. Two explosive cords housed in tubes held in place by two notched doublers and commercially available fasteners. When either cord fired, its tube expands, bending doublers and causing fracture at adjacent notch.

B90-10478

PRESSURE-MEASURING DIAPHRAGM TRANSMITS OPTICAL SIGNALS

ARTHUR J. HILL (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29535

Vol. 14, No. 9, P. 76

Proposed sapphire diaphragm performs two functions in instrumented research engine or pressure vessel. Serves both as pressure sensor and as window for observation, optical probing, or optical transmission of other measurements. Deflections of sapphire diaphragm alters resistances of strain gauges mounted around its periphery. At same time, transparent material enables optical measurements of conditions in chamber. Additional information obtained about conditions in chamber without need for additional sensor mounts.

B90-10479

SIMPLE, INTERNALLY ADJUSTABLE VALVE

RICHARD K. BURLEY (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29463

Vol. 14, No. 9, P. 76

Valve containing simple in-line, adjustable, flow-control orifice

made from ordinary plumbing fitting and two allen setscrews. Construction of valve requires only simple drilling, tapping, and grinding. Orifice installed in existing fitting, avoiding changes in rest of plumbing.

B90-10480

PREDICTING UNSTEADY AEROELASTIC BEHAVIOR

THOMAS W. STRGANAC, and DEAN T. MOOK (Virginia Polytechnic Inst. and State Univ.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14130

Vol. 14, No. 9, P. 77

New method for predicting subsonic flutter, static deflections, and aeroelastic divergence developed. Unsteady aerodynamic loads determined by unsteady-vortex-lattice method. Accounts for aspect ratio and angle of attack. Equations for motion of wing and flow field solved iteratively and simultaneously. Used to predict transient responses to initial disturbances, and to predict steady-state static and oscillatory responses. Potential application for research in such unsteady structural/flow interactions as those in windmills, turbines, and compressors.

B90-10481

ACOUSTIC REDUCTION OF SEPARATION OF FLOW

K. B. M. Q. ZAMAN, and D. J. MCKENZIE

Sep. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-12552)'Control of 'Laminar Separation' Over Airfoils by Acoustic Excitation.'

LEW-14876

Vol. 14, No. 9, P. 78

Report discusses experiments in use of acoustic excitation to reduce separation of two-dimensional laminar flow about airfoils at low angles of attack. Purpose of investigation to gain better understanding of effect of excitation, scaling of parameters of excitation, and ranges of frequencies in which excitation reduces separation effectively.

B90-10482

ANALYSIS OF STEPPED LABYRINTH SEALS

JOSEPH K. SCHARRER (Rockwell International Corp.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29585

Vol. 14, No. 9, P. 79

Report presents analysis of compressible flow in stepped labyrinth gas seal in turbomachine. Part of continuing effort to understand and suppress self-excited vibrations caused by stepped labyrinth seals. Rotordynamic coefficients derived for compressible flow.

B90-10536

CODE FOR ANALYSIS OF WING-AND-FLAP SYSTEMS

CHRISTINE M. DARDEN, and HARRY W. CARLSON (Planning Research Corp.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13994

Vol. 14, No. 10, P. 74

SUBAERF2 program developed to provide for analysis of subsonic aerodynamics and design by iteration of low-speed wing/flap systems. Based on linearized-theory lifting-surface solution but also accounts for some nonlinear characteristics. Effects of leading- and trailing-edge flaps included. New and improved version of programs described in LAR-13116 and LAR-12987, and replaces both of them. Written in FORTRAN V.

B90-10537**WING-DESIGN AND -ANALYSIS CODE**

CHRISTINE M. DARDEN, and HARRY W. CARLSON (Planning Research Corp.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13995**Vol. 14, No. 10, P. 74**

WINGDES2 computer program provides wing-design algorithm based on modified linear theory taking into account effects of attainable leading-edge thrust. Features improved numerical accuracy and additional capabilities. Provides analysis as well as design capability and applicable to both subsonic and supersonic flow. Replaces earlier wing-design code designated WINGDES (see LAR-13315). Written in FORTRAN V.

B90-10541**MECHANIZED FLUID CONNECTOR AND ASSEMBLY TOOL**

RONALD C. ZENTNER (Boeing Aerospace Co.), and STEVEN A. SMITH (Boeing Aerospace Co.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21434**Vol. 14, No. 10, P. 79**

In new tool-and-connector system, necessary to have access to only one side of pipe, access offset from centerline. Connections made or broken in confined spaces and with small external forces. Tool turns spur gear on externally threaded retainer on left member of connector. Retainer engages nut on right member of connector. Intended for assembly of pipes in proposed Space Station, tool and fitting used on Earth to make or break plumbing connections in crowded utility runs or other confined spaces where wrenches cannot be turned, where forces exerted by wrenches might cause damage, or where lack of good grip prevents technician from exerting sufficient torque on connector.

B90-10542**MONITORING SMALL DEFORMATIONS IN AN INSTRUMENT**

JOHN G. HAGOPIAN, and WILLIAM NORTHCUTT (Fairchild Space Co.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13271**Vol. 14, No. 10, P. 80**

Relatively simple source/detector pairs measure changes affecting optical alignment. System for monitoring small thermal, gravitational, and dynamical deformations in x-ray telescope includes two sources of infrared light, each associated with dual-axis, position-sensing photodiode. Principle of operation straightforward and applicable to monitoring of small lateral translations and/or rotations between different parts in machinery, buildings, bridges, ships, and other large structures.

B90-10543**SHAFT ADAPTER FOR DATA COUPLER**

JAMES R. ELLIOTT, and MARK T. LORD

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13805**Vol. 14, No. 10, P. 80**

Shaft adapter developed to provide means for securing Acurex 1200B universal data coupler to rotating instrumented shaft. Consists of two major parts: shaft sleeve and shaft clamp. Provides for accurate measurements of stresses and strains in shaft.

B90-10544**EXPERIMENTS ON ACTIVE MEMBERS IN LARGE SPACE STRUCTURES**

JAMES L. FANSON (Caltech), and JOHN A. GARBA (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17623**Vol. 14, No. 10, P. 81**

Report discusses continuing research on structures including active members, which incorporate sensors, actuators, and electronic circuits to monitor and control vibrations. Describes experiments on two structures with active members, progress in design, testing, and simulation of behavior of active members. Objective is to develop systems to enhance performances of large, flexible structures in space. Also applicable to some terrestrial structures and testing equipment involving close tolerances in feedback control of forces and/or positions.

B90-10545**SIMULATION OF THREE-DIMENSIONAL SUPERSONIC FLOWS**

DENNY S. CHAUSSEE

Oct. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-21421)

ARC-12235**Vol. 14, No. 10, P. 82**

Complicated flows computed with fair accuracy. Report describes simulations of steady, three-dimensional, viscous, supersonic flows by NASA Ames Parabolized Navier-Stokes computer code. Based on assumption flow supersonic in streamwise direction and subsonic flow in viscous sublayer always positive in streamwise direction. Predicts flows in regions of canopies, wings, and canards in addition to simple symmetric configurations used to demonstrate computational techniques. Also simulates interactions between aerodynamic surfaces.

B90-10546**COMPUTING BLOOD FLOWS**

D. KWAK, J. L. C. CHANG, S. E. ROGERS, and M. ROSENFELD

Oct. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-21422)'Potential Applications Of Computational Fluid Dynamics To Biofluid Analysis.'

ARC-12253**Vol. 14, No. 10, P. 83**

Methods developed for aerospace applied to mechanics of biofluids. Report argues use of advanced computational fluid dynamics to analyze flows of biofluids - especially blood. Ability to simulate numerically and visualize complicated, time-varying three-dimensional flows contributes to understanding of phenomena in heart and blood vessels, offering potential for development of treatments for abnormal flow conditions.

B90-10547**EFFECTS OF RAPID CRUSHING ON COMPOSITES**

GARY L. FARLEY (Army Aerostructures Directorate)

Oct. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-25438)'The Effects Of Crushing Speed On The Energy-Absorbing Capability Of Composite Material.'

LAR-14087**Vol. 14, No. 10, P. 84**

Experimental study described in NASA technical memorandum performed to determine whether crash energy-absorption capabilities of graphite/epoxy and Kevlar/epoxy composite materials are functions of speed of crushing. Additional objective to develop understanding of mechanisms of crushing. Technology applied to enhancement of safety and crashworthiness of automobiles, design of energy-absorbing devices in machinery, and problems involving explosions and impacts.

B90-10548**COMPARISON OF CALCULATIONS OF VISCOUS TRANSONIC FLOW**

TERRY L. HOLST

Oct. 1990 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12192**Vol. 14, No. 10, P. 85**

Report presents compendium of results of numerical simulations of viscous transonic flows about airfoils. Results appear in narrative, tabular, and graphical form to facilitate comparisons with each other and with measured data.

B90-10598**LOW-THERMAL-STRESS STRUCTURAL JOINTS FOR DISSIMILAR MATERIALS**

EDWARD C. MATZA (LTV Corp.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14138**Vol. 14, No. 11, P. 75**

Structural joint developed for attachment of hypersonic control surface to aircraft wing structure. Transmits large torque loads from composite control surface and torque tube to wing structure through metallic attachment lug and collar. Torque load transmitted from tube to collar by series of radially oriented cleats. Bearing surfaces of cleats plane passing through center-line of torque tube. Such joints accommodate differential thermal growth between parts of dissimilar materials. Potential for application to high-temperature structural joints associated with hypervelocity vehicles.

B90-10599**PREVENTING VENTILATION ON SAILBOARD SKEGS**

RICHARD A. CALDWELL (George Washington Univ.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14008**Vol. 14, No. 11, P. 75**

Design effort undertaken to solve spinout problem plaguing high-performance sailboards. Proposed skeg section designed by use of computer model of pressure field and boundary layer. Prevents ventilation by maintaining attached boundary-layer flow throughout operating environment. Cavitation also avoided by preventing valleys in pressure distribution while skeg operated throughout its range.

B90-10600**PREDICTIONS OF DRAG IN VISCOUS TRANSONIC FLOW**

TERRY L. HOLST

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-22009) 'Computational Fluid Dynamics Drag Prediction - Results From The Viscous Transonic Airfoil Workshop'

ARC-12252**Vol. 14, No. 11, P. 76**

NASA technical memorandum summarizes results of computations of viscous, transonic flow reported at Viscous Transonic Airfoil Workshop. Results reexamined and analyzed with special emphasis on drag. Compared with each other and with data from experiments. Test cases include attached and separated transonic flows about NACA 0012 airfoil.

B90-10601**MEASUREMENTS OF SHOCK-SEPARATED TURBULENT BOUNDARY LAYERS**

J. D. BROWN, J. L. BROWN, and M. I. KUSSOY

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-27519) 'A Documentation of Two- and Three-Dimensional Shock-Separated Turbulent Boundary Layers.'

ARC-12298**Vol. 14, No. 11, P. 78**

Report documents surface and flow-field measurements of two- and three-dimensional, shock-separated, turbulent boundary layers. Data tabulated to facilitate comparison with other measurements and computations. Shows shock-interaction shadowgraph and

oil-flow pattern for each angle. Plotted profiles given for pressures, velocities, Reynolds stresses, and turbulent kinetic energies.

B90-10602**DYE TRACING OF FLOW ON FOREBODY OF AIRPLANE**

DAVID F. FISHER, DAVID M. RICHWIND (PRC Systems Services Co.), and DANIEL W. BANKS (Langley Research Center)

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-21127)

ARC-12237**Vol. 14, No. 11, P. 78**

Report describes experiments in which flows over forebody of F-18 airplane visualized by emitting liquid containing dye from orifices on forebody. In this method, liquid flows along body and evaporates, leaving behind lines of dye marking streamlines and photographed after test flight. Results similar to those of wind-tunnel oil flows.

B90-10603**PASSIVE DAMPING OF VIBRATIONS IN TRUSS STRUCTURES**

GUN-SHING CHEN (Caltech), and BEN K. WADA (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17609**Vol. 14, No. 11, P. 79**

Damping enhanced by redistribution of shear strains in damping materials. Report describes theoretical and experimental investigations of passive damping of vibrations in truss structures. Interest in passive damping revived by proposals to construct large trusses in outer space. Focuses on use of viscoelastic materials to damp longitudinal vibrations in tubular members of such structures.

B90-10649**INTEGRATED ANALYSIS CAPABILITY (IAC)**

H. P. FRISCH

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13341**Vol. 14, No. 12, P. 44**

IAC system interactive tool for robotics design, integrating common database with programs from fields of structures, thermodynamics, controls and system dynamics. Written in FORTRAN 77.

B90-10654**SPACE SYSTEMS INTEGRATED SIMULATION (SPASIS)**

J. M. STECKLEIN, C. PLOWMAN, A. LEWIS, B. DRAKE, and K. LEAHY

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21462**Vol. 14, No. 12, P. 44**

Complex program models everything on user-defined space station, from control gyros to mass effect of astronaut moving along strut. Other features include plume impingement, attitude control, propellant slosh, docking, and gravity.

B90-10656**ARTIFICIAL SATELLITE ANALYSIS PROGRAM (ASAP)**

JOHNNY H. KWOK (Jet Propulsion Lab., California Inst. of Tech., Pasadena.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17522**Vol. 14, No. 12, P. 44**

Program suited for studying planetary orbit missions including mapping and flyby components. Sample data included for geosynchronous station drift cycle study. Venus radar mapping

strategy, frozen orbit about Mars, and repeat ground trace orbit. Written in FORTRAN.

B90-10657**MEASURING MONODISPERSE SMALL PARTICLES EN MASSE**

ROBERT A. BRUCE, and CECIL E. NICHOLS, JR.
Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14152**Vol. 14, No. 12, P. 45**

New optical method enables determination of sizes of approximately-micron-sized particles. Arrays of particles act as diffraction gratings. Simple and inexpensive apparatus replaces high-magnification microscopes in measurements of diameters of small polystyrene latex spheres. Device being used to determine monodispersity and diameters of polystyrene latex microspheres used as seeding material for laser-velocimetry flow measurements in NASA's wind tunnels. Characterization of particle sizes important in wide range of fields, including manufacture of plastics and ceramics, biochemistry, and medicine.

B90-10658**O-RING-TESTING FIXTURE**

JAMES E. TURNER, and D. SCOTT MCCLUNEY
Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28376**Vol. 14, No. 12, P. 46**

Fixture used to evaluate properties of O-rings of various materials. Hydraulic actuator positions plug in housing, creating controlled, variable gap in O-ring glands formed by grooves in plug and by inner wall of housing. Creates controlled axial and radial gaps between sealing surfaces around ring so effectiveness of material in maintaining seal determined under dynamic conditions.

B90-10659**CORROSION-RESISTANT BALL BEARINGS**

E. M. ZDANKIEWICZ (Life Systems, Inc.), E. L. LINABURG (Life Systems, Inc.), and L. J. LYTLE (Quality Bearing, Inc.)
Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21319**Vol. 14, No. 12, P. 46**

Self-lubricating bearing system withstands highly corrosive environment of wastewater-recycling unit. New bearings contain cobalt-based-alloy balls and races, graphite/polyimide polymer ball cages, and single integral polytetrafluoroethylene seals on wet sides. Materials and design prevent corrosion by acids and provide lubrication.

B90-10660**SPRING-LOADED-BOLT LOCKING DEVICE**

FRANK S. CALCO
Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14887**Vol. 14, No. 12, P. 47**

Locking device designed to clamp small objects temporarily onto object or vehicle that accelerates. Intended to be used in place of toggle clamp, which can snap out of lock during excessive shock or vibration or because of accidental contact of person or object with toggle locking handle. Device looks and operates somewhat like spring-loaded door bolt. Moderate vibrations do not cause accidental unlocking.

B90-10661**ATOMIZED WATER AS COUPLANT FOR ULTRASONIC INSPECTION**

CARL G. BOUVIER (Martin Marietta Corp.)
Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28442**Vol. 14, No. 12, P. 47**

Simple technique makes possible to use demineralized water as coupling fluid for manual-scan ultrasonic inspection of convex objects. Fine mist of demineralized water sprayed onto part to be inspected, by use of simple pump spray bottle equipped with atomizing nozzle. As transducer scans across surface, droplets feed film of water under transducer. Excess water runs off part. Inspected areas then distinguished visually from uninspected areas by absence or presence of droplets, respectively.

B90-10662**TRAP FOR NONCONDENSABLE GAS IN HEAT-TRANSFER FLUID**

FRED EDELSTEIN (Grumman Aerospace Corp.), BRUCE CORDES (Grumman Aerospace Corp.), and RICHARD F. BROWN (Grumman Aerospace Corp.)

Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21389**Vol. 14, No. 12, P. 48**

Trap acts as scrubber by removing noncondensable gas as it is generated slowly or released by outgassing in vapor/liquid heat-transfer system. Includes tube of stainless steel or other poorly thermally conductive material attached to tap on top of main vapor line where vapor flows toward condenser. Sub-cooled liquid from outlet of condenser cools upper end of tube below vapor temperature.

07 MACHINERY**B86-10062****TRANSFER MECHANISMS FOR HEAVY LOADS**

V. CASSISI
Jun. 1986

KSC-11292**Vol. 10, No. 1, P. 108**

Soft hydraulic system gently maneuvers loads. Upper and lower load-transfer mechanisms attach through mounting holes in vertical beam adjustable or gross positioning. Fine positioning of load accomplished by hydraulic cylinders that move trunnion support and trunnion clamp through short distances. Useful in transferring large loads in railroads, agriculture, shipping, manufacturing, and even precision assembly of large items.

B86-10063**MULTILEG HEAT-PIPE EVAPORATOR**

J. P. ALARIO (Grumman Aerospace Corp.), and R. A. HASLETT (Grumman Aerospace Corp.)

Jun. 1986

MSC-20812**Vol. 10, No. 1, P. 109**

Parallel pipes provide high heat flow from small heat exchanger. Six parallel heat pipes extract heat from overlying heat exchanger, forming evaporator. Vapor channel in pipe contains wick that extends into screen tube in liquid channel. Rods in each channel hold wick and screen tube in place. Evaporator compact rather than extended and more compatible with existing heat-exchanger

geometries. Prototype six-pipe evaporator only 0.3 m wide and 0.71 m long. With ammonia as working fluid, transports heat to finned condenser at rate of 1,200 W.

B86-10064**MANUAL 'GUILLOTINE' WIRECUTTER**

W. J. WEDLAKE (McDonnell Douglas Corp.)

Jun. 1986

MSC-20926

Vol. 10, No. 1, P. 110

Many wires cut in one operation. Guillotine wirecutter powered by handcrank. Crank turns recirculating-ball screw, which pushes blade through bundle of wires in cutting block. Designed to help astronauts break through spacecraft payload cables while working outside spacecraft. Used on Earth for emergency cable separation or cable trimming in production.

B86-10065**MANIFOLD COAL-SLURRY TRANSPORT SYSTEM**

S. G. LIDDLE (Caltech), J. M. ESTUS (Caltech), and M. L. LAVIN (Caltech)

Jun. 1986

NPO-16471

Vol. 10, No. 1, P. 110

Feeding several slurry pipes into main pipeline reduces congestion in coal mines. System based on manifold concept: feeder pipelines from each working entry joined to main pipeline that carries coal slurry out of panel and onto surface. Manifold concept makes coal-slurry haulage much simpler than existing slurry systems.

B86-10066**HEAT PIPE PRECOOLS AND REHEATS DEHUMIDIFIED AIR**

R. C. KONING, W. H. BOGGS, U. R. BARNETT, and K. DINH (Dinh Co.)

Jun. 1986

KSC-11311

Vol. 10, No. 1, P. 111

Precooling and reheating by heat pipe reduces operating costs of air-conditioning. Warm air returned from air-conditioned space and cooled air supplied are precooled and reheated, respectively, by each other through a heat pipe. Heat-pipe technology brought to bear on problem of conserving airconditioning energy in hot, humid environments. Any increase in the cost of equipment due to installation of heat-pipe heat exchangers expected to be recovered in energy savings during service period of 2 years or less.

B86-10067**JIG FOR REMOVING RIVETS**

T. P. ROEBUCK (Rockwell International Corp.), and A. E. HOUSER (Rockwell International Corp.)

Jun. 1986

MSC-20757

Vol. 10, No. 1, P. 113

Drill-press jig used to remove improperly installed rivets. Drillpress jig makes possible to drill accurately-centered, straight holes through rivets. Key component of jig is a drill bushing with spherical recess machined into base. Contour of recess matches contour of rivet head. Operator holds jig handle with one hand and controls drill with other. Handle and screw head hold drill bit in place over center of rivet so rivet drilled out through its axis. With rivet removed, parts separated and refastened or reused elsewhere.

B86-10068**DETECTION OF MACHINING CHIPS BY PRESSURE REVERSAL**

L. M. WYETT (Rockwell International Corp.)

Jun. 1986

MFS-29076

Vol. 10, No. 1, P. 114

Inaccessible interior spaces inspected acoustically. In acoustic inspection, inlet and outlet ports of component connected to pneumatic hoses of apparatus that rapidly reverses induced pressure differential. If loose particles inside this component, they will generate noise detected by series of contact microphones attached to component. Noise indicates general location of contaminants, and its characteristic helps in identifying particles from their acoustic signatures.

B86-10069**DIGITAL CONTROLLER FOR A REMOTE MANIPULATOR**

A. K. BEJCZY (Caltech), and S. LEE (Caltech)

Jun. 1986

NPO-16470

Vol. 10, No. 1, P. 114

Sealed forces and displacements fed back to operator to facilitate control. Processing of data distributed among six microcomputers. Each microcomputer dedicated to specific task and communicates with others at same station or at opposite station.

B86-10070**PORTABLE HYDRAULIC POWERPACK**

L. A. ANDERSON (University of Central Florida), R. L. HENRY (University of Central Florida), O. H. FEDOR (Lockheed Corp.), and L. J. OWENS (Planning Research Corp.)

Jun. 1986

KSC-11318

Vol. 10, No. 1, P. 115

Rechargeable hydraulic powerpack functions as lightweight, compact source of mechanical energy. Self-contained hydraulic powerpack derives energy from solid chemical charge. Combustion of charge initiated by small hammer, and revolving feeder replaces charges expended. Combustion gases cool during expansion in turbine and not too hot for release to atmosphere. Unit has applications driving wheelchairs and operating drills, winches, and other equipment in remote areas. Also replaces electric motors and internal-combustion engines as source of power in explosive atmospheres.

B86-10071**OSCILLATION DAMPER WITH TWO SPRING RATES**

D. R. SEVILLA (Caltech)

Jun. 1986

NPO-16223

Vol. 10, No. 1, P. 116

Hydraulic damping used in device developed to stabilize vibrating structure in space. Damping mechanism stops oscillation of attached boom. Two bellows provide fluid damping. Springs are engaged when extra spring force required. Otherwise they retract. Mechanism especially useful for arresting oscillatory motion of slender boom with large mass. On Earth, such configurations arise in design of masts and cranes.

B86-10072**DUAL-FLOW-RATE VALVE**

R. H. ALLBRITAIN (Rockwell International Corp.)

Jun. 1986

MSC-20849

Vol. 10, No. 1, P. 116

Flow-control device precisely adjusted for two rates. Heart of twoposition valve is sliding poppet. At far-right position, poppet allows low flow. At far-left position, allows high flow. Valve supplies high-pressure gas at either of two preselected flow rates. Valve adjustable between 0.12 and 1.2 lb/s (0.054 and 0.54 kg/s) of hydrogen at 3,300 lb/in.² (23 MN/m²) and 80 degrees F (27 degrees C). Two flow rates preadjusted between these limits in increments of 0.01 lb/s (0.0045 kg/s).

B86-10073**ROTARY JOINTS WITH ELECTRICAL CONNECTIONS**

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F. W. OSBORN (Caltech)

Jun. 1986

NPO-16250

Vol. 10, No. 1, P. 117

Power and data transmitted on many channels. Two different rotary joints equipped with electrical connections between rotating and stationary parts. One joint transmits axial thrust and serves as interface between spinning and nonspinning parts of Galileo spacecraft. Other is scanning (limited rotation) joint that aims scientific instruments from nonspinning part. Selected features of both useful to designers of robots, advanced production equipment, and remotely controlled instruments.

B86-10074

EMERGENCY BRAKE FOR TRACKED VEHICLES

G. L. GREEN (Pan American World Airways, Inc.), and S. L. HOOPER (Pan American World Airways, Inc.)

Jun. 1986

MSC-20513

Vol. 10, No. 1, P. 118

Caliper brake automatically stops tracked vehicle as vehicle nears end of travel. Bar on vehicle, traveling to right, dislodges block between brake pads. Pads then press against bar, slowing vehicle by friction. Emergency braking system suitable for elevators, amusement rides and machine tools.

B86-10075

'CURTAINLESS' WINDOW

D. L. CONNELLY

Jun. 1986

MSC-18417

Vol. 10, No. 1, P. 119

Liquid flow switches window from transparency to opacity. Pump transfers liquid from reservoir to window voids. Gas-venting pipe transfers gas to reservoir when window is filling and to window when window is emptying.

B86-10076

SECURE DISPOSAL CONTAINER FOR CLASSIFIED PAPERS

EARL R. COLLINS, JR. (Caltech)

Jun. 1986

NPO-16517

Vol. 10, No. 1, P. 120

Meshing steel combs retain papers when container overturned. Comblike shutters installed on hinges near deflectors. If container is upright, combs hang vertically and out of way. When container is tipped or overturned, gravity forces one or both of combs to fall over opening. When this happens, teeth intermesh and container opening covered, preventing its contents from falling out.

B86-10077

ROTATING DRIVE FOR ELECTRICAL-ARC MACHINING

C. D. FRANSEN (Rockwell International Corp.)

Jun. 1986

MFS-19946

Vol. 10, No. 1, P. 120

Rotating drive improves quality of holes made by electrical-arc machining. Mechanism (Uni-tek, rotary head, or equivalent) attached to electrical-arc system. Drive rotates electrode as though it were mechanical drill, while an arc disintegrates metal in workpiece, thereby creating hole. Rotating electrode method often used in electric-discharge machining. NASA innovation is application of technique to electrical-arc machining.

B86-10078

VARIABLE-DISPLACEMENT HYDRAULIC DRIVE UNIT

D. J. LANG (Sundstrand Energy Systems), D. J. LINTON (Sundstrand Energy Systems), and A. MARKUNAS (Sundstrand Energy Systems)

Jun. 1986

MSC-20728

Vol. 10, No. 1, P. 121

Hydraulic power controlled through multiple feedback loops. In hydraulic drive unit, power closely matched to demand, thereby saving energy. Hydraulic flow to and from motor adjusted by motor-control valve connected to wobbler. Wobbler angle determines motor-control-valve position, which in turn determines motor displacement. Concept applicable to machine tools, aircraft controls, and marine controls.

B86-10079

SURVEY OF HAND CONTROLLERS FOR TELEOPERATION

T. L. BROOKS (Caltech), and A. K. BEJCZY (Caltech)

Jun. 1986

NPO-16610

Vol. 10, No. 1, P. 121

Report surveys handgrip designs, control-input devices, and control strategies. 83-page report presents comprehensive survey of hand-controller technology in three major categories: handgrip design, control-input devices, and control strategies. Approach taken in review to identify and describe existing handgrips, control-input devices and control strategies, and new components and techniques that become elements of advanced hand controllers to satisfy increasing performance requirements for teleoperation in future.

B86-10150

AIRCRAFT TAKEOFF AND LANDING ANALYSIS

J. R. MCGEHEE

Jun. 1986

LAR-13390

Vol. 10, No. 2, P. 102

Behavior of flexible or rigid aircraft simulated under variety of conditions. Active Gear, Flexible Aircraft Takeoff and Landing Analysis program, AGFATL, completely simulates aircraft takeoff and landing dynamics. AGFATL represents airplane either as rigid body with six degrees of freedom or as flexible body with multiple degrees of freedom. AGFATL written in FORTRAN IV for batch execution.

B86-10151

NONCONICAL RELAXATION FOR SUPERSONIC POTENTIAL FLOW

M. J. SICLARI (Grumman Aerospace Corp.)

Jun. 1986

LAR-13346

Vol. 10, No. 2, P. 104

Nonlinear, three-dimensional effects computed from full potential flow equation. Nonconical Relaxation program, NCOREL, employs new computational technique for prediction of inviscid, nonlinear supersonic aerodynamics. Unlike conventional linear potential equations, NCOREL utilizes full potential flow equation to predict formation of supercritical crossflow regions, embedded shocks, and bow shocks. NCOREL written in FORTRAN IV for batch execution.

B86-10152

ANALYSIS OF LUBRICANT JET FLOW

D. P. TOWNSEND, and L. S. AKIN (California State University at Long Beach)

Jun. 1986 See Also (N84-29224)

LEW-14242

Vol. 10, No. 2, P. 104

Computer program, IMPOUT 2, developed using newly-established 'limit formulas' to prevent lubricant non-impingement on pinion. Program used to analyze impingement depth on gear teeth for oil jet located at out-of-mesh position with arbitrary offset and inclination angles and with arbitrary addendum and center-distance modification. IMPOUT 2 program written in ANSI FORTRAN IV for use on CDC 750.

B86-10153**AERODYNAMIC CHARACTERISTICS OF NACA 16-SERIES AIRFOILS**C. M. MAKSYMUK, and S. A. WATSON VIKEN (University of Kansas Center for Research, Inc.)
Jun. 1986**LAR-13355****Vol. 10, No. 2, P. 104**

Standard data from literature incorporated into program. Comprehensive and easily-accessible data bank of aerodynamic characteristics of NACA 16series airfoils incorporated into AIRFOIL program for use in propeller performance research. Low-drag, high-critical-speed airfoils effective in advanced turbo-prop designs currently under investigation. AIRFOIL written in FORTRAN IV for batch execution.

B86-10154**WALL INTERFERENCE IN TWO-DIMENSIONAL WIND TUNNELS**WILLIAM B. KEMP, JR. (Virginia Associated Research Campus)
Jun. 1986**LAR-13394****Vol. 10, No. 2, P. 104**

Viscosity and tunnel-wall constraints introduced via boundary conditions. TWINTN4 computer program developed to implement method of posttest assessment of wall interference in two-dimensional wind tunnels. Offers two methods for combining sidewall boundary-layer effects with upper and lower wall interference. In sequential procedure, Sewall method used to define flow free of sidewall effects, then assessed for upper and lower wall effects. In unified procedure, wind-tunnel flow equations altered to incorporate effects from all four walls at once. Program written in FORTRAN IV for batch execution.

B86-10155**PREDICTING VORTEX SHEDDING IN SUPERSONIC FLOW**M. R. MENDENHALL (Nielsen Engineering and Research, Inc.), and S. C. PERKINS, JR. (Nielsen Engineering and Research, Inc.)
Jun. 1986**LAR-13375****Vol. 10, No. 2, P. 106**

Nonlinear aerodynamic characteristics of missile bodies computed. Program NOZVTX calculates nonlinear aerodynamic characteristics and flow fields of missile bodies at various angles-of-attack and roll in supersonic flow. Output includes geometry, centroids, and surface pressure of source panels and positions, strengths, and velocity components of shed vortices. NOZVTX written in FORTRAN IV for batch execution.

B86-10156**PREDICTING WALL MODIFICATIONS FOR ADAPTIVE WIND TUNNELS**J. L. EVERHART
Jun. 1986**LAR-13301****Vol. 10, No. 2, P. 106**

Wall shape changed iteratively until it matches streamlines. FLEXWAL predicts upper and lower wall modifications necessary to remove wall-interference effects in adaptive-wall wind tunnels. FLEXWAL aids in elimination of wall-interference effects on objects tested in typical two-dimensional wind tunnel with rigid sidewalls and flexible, solid floor and ceiling boundaries. Iterative procedure valid for subsonic and transonic test conditions, and convergence of method verified both analytically and experimentally. FLEXWAL written in FORTRAN IV for batch execution.

B86-10157**TWO PROGRAMS FOR SUPERSONIC WING DESIGN AND ANALYSIS**

W. H. MASON (Grumman Aerospace Corp.), B. S. ROSEN (Grumman Aerospace Corp.), and B. GROSSMAN (Grumman Aerospace Corp.)

Jun. 1986

LAR-13239**Vol. 10, No. 2, P. 106**

COREL and W12SC3 useful in aerodynamic design and analysis of wings for supersonic speeds. COREL (Conical Relaxation) program solves nonlinear full potential equation for spanwise section of wing in crossflow plane, and option exists to correct result for nonconical geometry. W12SC3 applies linear theory panel methods to compute solutions for wing/body configuration. Programs restricted to supersonic flows and useful for many design, analysis, and optimization applications. COREL and W12SC3 written in FORTRAN IV for batch execution.

B86-10158**SECOND-ORDER-POTENTIAL ANALYSIS AND OPTIMIZATION**W. C. CLEVER (Rockwell International Corp.)
Jun. 1986**LAR-13314****Vol. 10, No. 2, P. 107**

Optimum camber designed for supersonic and hypersonic vehicles. Second Order Potential Analysis and Optimization (SOPA) package set of computer programs used to predict aerodynamic characteristics and design optimum camber for both supersonic and hypersonic vehicles. Analysis program incorporates second-order-potential, small-disturbance theory for analysis of wing/body configurations. Optimization program uses analysis results to generate optimum camber, twist, or flap deflections by minimizing zero suction drag. SOPA written in FORTRAN V for batch execution.

B86-10171**DEVICE FOR EXTRACTING FLAVORS AND FRAGRANCES**F. R. CHANG
Jun. 1986**MSC-20761****Vol. 10, No. 2, P. 118**

Machine for making coffee and tea in weightless environment may prove even more valuable on Earth as general extraction apparatus. Zero-gravity beverage maker uses piston instead of gravity to move hot water and beverage from one chamber to other and dispense beverage. Machine functions like conventional coffeemaker during part of operating cycle and includes additional features that enable operation not only in zero gravity but also extraction under pressure in presence or absence of gravity.

B86-10172**MULTIPURPOSE SCRIBING AND DRAWING TOOL**J. M. ELLIS
Jun. 1986**MSC-20913****Vol. 10, No. 2, P. 119**

Two-part tool reconfigured for variety of jobs. Tool performs several functions useful in layout. Lines, curves, and angles made visible as either bright scribe marks or as dark pencil (or ink) marks. Multipurpose tool speeds up laying out of patterns on sheet metal, wood, plastic, or paper. Tool is carried in pocket, then quickly assembled for service as height gauge, pair of dividers, protractor, surface gauge, or square.

B86-10173**VARIABLE-FORCE EDDY-CURRENT DAMPER**R. E. CUNNINGHAM
Jun. 1986**LEW-13717****Vol. 10, No. 2, P. 120**

Variable damping achieved without problems of containing viscous fluids. Eddy-current damping obtained by moving copper or aluminum conductors through magnetic fields. Position of magnet carrier determines amount of field engagement and, therefore, amount of damping. Three advantages of concept: Magnitudes of stiffness and damping continuously varied from maximum to zero without bringing rotor or shaft to stop; used in rotating machines not having viscous fluids available such as lubricating oils; produces

07 MACHINERY

sizable damping forces in machines that pump liquid hydrogen at - 246 degrees C and liquid oxygen at - 183 degrees C and are compact in size.

B86-10174

IMPROVED SEAL FOR NTF FAN SHAFT

E. A. CROSSLEY, JR., J. A. JONES, R. MESSIER, G. W. JOHNSON, and K. FELTON (North Carolina State University)

Jun. 1986

LAR-13219

Vol. 10, No. 2, P. 127

New seal more effective and lasts longer. Seal consists of five felt rings interspersed with four polytetrafluoroethylene rings having inner diameter slightly larger than shaft. Spaces between polytetrafluoroethylene rings and shaft produce labyrinth effect, which increases degree of sealing.

B86-10175

GENTLE END EFFECTOR FOR ROBOTS

W. S. WEBB (Honeywell, Inc.)

Jun. 1986

MFS-28119

Vol. 10, No. 2, P. 128

Gripper handles electronic components without damaging them. Driven by dc motor, movable jaw gently clamps electronic component. Grips such electronic components as resistors, capacitors, and transistors without damaging them and holds them during soldering or other processing.

B86-10176

AUTOMATED CONDUIT UNLOADING

E. V. LEWIS (Caltech)

Jun. 1986

NPO-16187

Vol. 10, No. 2, P. 129

Large, cumbersome pipes removed from trailer by one operator. Swiveltruck trailer carries conduit and unloads it. Vertical bins interconnected by web belts that elevate conduit sections for delivery by gravity to unloading point. Trailer loaded with slurry-pipe sections 6 inches (15.2 centimeters) in diameter, but bin width readily changed to hold other sizes. Simple adjustments in bin-partition and web-belt positions needed to adapt system to different conduit cross sections.

B86-10177

OIL-FREE COMPRESSOR

D. G. FITZJERRELL (Management and Technical Services Co.), T. L. BELVER (Management and Technical Services Co.), and H. E. MOORE (Management and Technical Services Co.)

Jun. 1986

MSC-20860

Vol. 10, No. 2, P. 130

Compressor pistons moved by eccentric shaft need no lubricants. Compressor has shaft, middle section is eccentric in relation to end sections. Driven by brushless dc motor, shaft turns inner races of set of four cam bearings. Outer cam-bearing races in turn actuate four pistons spaced equally apart, around and along shaft. Each outer bearing race held in position by pressure exerted on it by piston. Because no frictional motion between piston and outer bearing race, lubricant between them unnecessary. Cam bearings themselves contain potted internal lubricant. Originally proposed for use in space, new compressor for refrigerators or freezers does not depend on pool of oil for lubricating its pistons. Operated in any orientation.

B86-10178

PRESSURE-LETDOWN MACHINE FOR A COAL REACTOR

G. S. PERKINS (Caltech), and W. B. MABE (Caltech)

Jun. 1986

NPO-15083

Vol. 10, No. 2, P. 131

Pumps operating in reverse generate power. Conceptual

pressure-letdown machine for coal-liquefaction system extracts energy from expansion of product fluid. Mud pumps, originally intended for use in oil drilling, operated in reverse so their motors act as generators. Several pumps operated in alternating phase to obtain multiple stages of letdown from inlet pressure to outlet pressure. About 75 percent of work generates inlet pressure recoverable as electrical energy.

B86-10179

HELICOPTER TAIL-BOOM STRAKES

H. L. KELLEY (U.S. Army Aerostructures Directorate), A. E. PHELPS, III (U.S. Army Aerostructures Directorate), and J. C. WILSON (U.S. Army Aerostructures Directorate)

Jun. 1986

LAR-13233

Vol. 10, No. 2, P. 132

Yaw control and overall efficiency increased at hover and low speeds. Wind-tunnel investigation showed strake located on left side of tail boom has potential to reduce high adverse side loads on tail boom in hover and in sideward flight. Test demonstrated addition of single long strake to left side of tail boom most effective configuration for reducing left pedal requirements in right sideward flight.

B86-10180

AIR-BEARING TABLE FOR MACHINE SHOPS

D. AMBRISCO (Rockwell International Corp.)

Jun. 1986

MFS-29035

Vol. 10, No. 2, P. 134

Frequent workpiece repositioning made easier. Air-bearing table facilitates movement of heavy workpiece during machining or between repeated operations at different positions. Table assembly consists of workpiece supporting fixture riding on air bearing. Table especially useful for inertia welding, in which ease of mobility is important.

B86-10181

ELECTROMECHANICAL TURBOPROP-PITCH-CONTROL MECHANISM

B. M. STEINETZ, S. LOWENTHAL, D. F. SARGISSON (General Electric Co.), and G. WHITE (Transmission Research, Inc.)

Jun. 1986 See Also (N84-25605)

LEW-14234

Vol. 10, No. 2, P. 134

Propeller-control system autonomous and tolerant of failure. Mounting electrical-power module and conditioning/control systems inboard rotating propeller hub eliminates failure-prone slipring devices and creates autonomous, failure-tolerant propeller-control system. Modular component design facilitates on-the-wing maintenance. System highly adaptive to various sizes and gearbox configurations. Features and capabilities described unmatched by any comparable PCM now in existence. These capabilities needed by large, fuel-efficient, commuter turboprop aircraft now being developed by aircraft industry.

B86-10182

OPERATING A REMOTE MANIPULATOR IN SIMULATED LOW GRAVITY

A. K. BEJCZY (Caltech), and K. M. CORKER (Caltech)

Jun. 1986

NPO-16477

Vol. 10, No. 2, P. 137

Efforts to control remote manipulators in simulated microgravity described in report. Experiments conducted to determine effects of weightlessness on performance of operator controlling remote manipulator, or slave arm, by master arm at control station. Report concludes microgravity disturbs neuromotor control of human arm. Also suggests disturbance compensated for by adjustments in controller.

B86-10242**HYTESS-HYPOTHETICAL TURBOFAN-ENGINE SIMPLIFIED SIMULATION**

W. MERRILL, C. BEATTIE (Pratt & Whitney Aircraft Co.), R. LAPRAD (Pratt & Whitney Aircraft Co.), S. ROCK (Systems Control Technology, Inc.), and M. AKHTER (Systems Control Technologies, Inc.)

May 1986

LEW-14020**Vol. 10, No. 3, P. 82**

Simulated characteristics mimic those of advanced turbofan engines. Computer program developed to offer those interested in engine dynamics and controls research efficient, realistic, and easily-used engine simulation. Simulation developed from linearized operating-point models but still retains essential nonlinear engine effects. Representative of hypothetical, low-bypass-ratio, twin-spool, axialflow turbofan engine. Program written in FORTRAN IV.

B86-10243**AIRCRAFT ROLLOUT ITERATIVE ENERGY SIMULATION**

L. KINOSHITA (Rockwell International Corp.)

May 1986

MSC-20816**Vol. 10, No. 3, P. 82**

Aircraft Rollout Iterative Energy Simulation (ARIES) program analyzes aircraft-brake performance during rollout. Simulates threedegree-of-freedom rollout after nose-gear touchdown. Amount of brake energy dissipated during aircraft landing determines life expectancy of brake pads. ARIES incorporates brake pressure, actual flight data, crosswinds, and runway characteristics to calculate following: brake energy during rollout for up to four independent brake systems; time profiles of rollout distance, velocity, deceleration, and lateral runway position; and all aerodynamic moments on aircraft. ARIES written in FORTRAN 77 for batch execution.

B86-10244**ESTIMATING TRANSIENT PRESSURE SURGES IN CRYOGENIC SYSTEMS**

P. PFISTER (University of Central Florida), F. GUNNERSON (University of Central Florida) 03(University of Central Florida), and E. HOSLER

May 1986

KSC-11312**Vol. 10, No. 3, P. 83**

Potentially-damaging pressure waves anticipated and, therefore, avoided. Mathematical model developed for prediction of pressure behavior in single-and two-phase cryogenic systems. Transient liquid-flow analysis modified to incorporate behavior of vapor bubbles and used to predict maximum pressure in cryogenic transfer systems consisting of complex pipe and valve arrangements under both steady-state and transient conditions. Simulation compared favorably with data obtained during transfer of liquid oxygen from ground storage tanks to Space Shuttle orbiter external tanks. Program written in FORTRAN 77 for batch execution.

B86-10245**COMPUTING COOLING FLOWS IN TURBINES**

J. GAUNTNER

May 1986

LEW-13999**Vol. 10, No. 3, P. 83**

Algorithm developed for calculating both quantity of compressor bleed flow required to cool turbine and resulting decrease in efficiency due to cooling air injected into gas stream. Program intended for use with axial-flow, air-breathing, jet-propulsion engines with variety of airfoil-cooling configurations. Algorithm results compared extremely well with figures given by major engine manufacturers for given bulk-metal temperatures and cooling configurations. Program written in FORTRAN IV for batch execution.

B86-10246**FOUR-CYLINDER STIRLING-ENGINE COMPUTER PROGRAM**

C. J. DANIELE, and C. F. LORENZO

May 1986

LEW-14155**Vol. 10, No. 3, P. 83**

Computer program developed for simulating steady-state and transient performance of four-cylinder Stirling engine. In model, four cylinders interconnected by four working spaces. Each working space contains seven volumes: one for expansion space, heater, cooler, and compression space and three for regenerator. Thermal time constant for regenerator mass associated with each regenerator gas volume. Former code generates results very quickly, since it has only 14 state variables with no energy equation. Current code then used to study various aspects of Stirling engine in much more detail. Program written in FORTRAN IV for use on IBM 370 computer.

B86-10266**MODIFIED COBALT DRILLS WITH OIL PASSAGES**

E. HUTCHISON (Rockwell International Corp.), and D. RICHARDSON (Rockwell International Corp.)

May 1986

MFS-29137**Vol. 10, No. 3, P. 106**

Oil forced through drill shanks to lubricate cutting edges. Drill bits cooled and lubricated by oil forced through drill shanks and out holes adjacent to bits. This cooling technique increases drillbit life and allows increased drill feed rates.

B86-10267**SPIRAL-GROOVE RING SEAL FOR COUNTERROTATING SHAFTS**

E. DIRUSSO

May 1986 See Also N83-25712/NSP

LEW-14248**Vol. 10, No. 3, P. 107**

Self-lubricating seal tolerates high sliding speeds. Application of self-acting geometry in form of spiral grooves to faces of ring-seal housing maintains thin air film of relatively high stiffness between seal ring and housing, enabling seal to operate in noncontacting mode over entire engine-operating range. Potential application in sealing fan-bleed air between two counter-rotating shafts in advanced gas-turbine engines.

B86-10268**DESIGNING POWER-TRANSMISSION SHAFTING**

S. H. LOEWENTHAL

May 1986 See Also N84-27041/NSP

LEW-14240**Vol. 10, No. 3, P. 109**

Consideration of stress and fatigue life gives better designs. Shafting-design procedure developed based on fatigue-strength considerations. Method accounts for effects of static and constant-amplitude fluctuating loads. Also provides shaft-diameter estimates for variable amplitude-loading duty cycles. Method lends itself to computer-aided design of both aerospace and industrial shafting.

B86-10269**LOCATING CRACKS AMID PITTING AND CORROSION**

P. P. FAHEY (Fairchild Republic Co.)

May 1986

MSC-20311**Vol. 10, No. 3, P. 110**

Use of two fluorescent penetrants reveals cracks. New inspection technique for locating cracks in metal parts. Dual-dye technique used to inspect metal parts having surface-roughness-height ratings from 125 to 450 microinch (3.2 to 11.4 micrometer). Parts have included shot-peened machined aluminum extrusions; partially machined aluminum castings; aluminum, steel, and titanium tabular weldments; aircraft landing-gear components; chemically milled aluminum sheet and

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extrusions; and rough-machined aluminum and steel forgings. Also used on nonporous ceramic parts.

B86-10270

ELIMINATING THERMAL CRACKS IN FLANGE/DUCT JOINTS

J. E. ADAMS (Rockwell International Corp.)

May 1986

MSC-20833

Vol. 10, No. 3, P. 111

Improved technique for attaching aluminum flange to aramid/epoxy duct prevents subsequent development of cracks in joint during thermal stress. Flange butted against cylindrical mold on which duct is fabricated. Flange has tapered neck so will nest in duct opening. Epoxy-impregnated aramid tape wrapped around mold so tape overlaps flange. While tape is wrapped, pressure applied to it and inside of flange as heated uniformly to maximum expected operating temperature. Heat and pressure maintained until aramid/epoxy laminations have cured.

B86-10271

ADAPTING INSPECTION DATA FOR COMPUTER NUMERICAL CONTROL

E. E. HUTCHISON (Rockwell International Corp.)

May 1986

MFS-29117

Vol. 10, No. 3, P. 112

Machining time for repetitive tasks reduced. Program converts measurements of stub post locations by coordinate-measuring machine into form used by numerical-control computer. Work time thus reduced by 10 to 15 minutes for each post. Since there are 600 such posts on each injector, time saved per injector is 100 to 150 hours. With modifications this approach applicable to machining of many precise holes on large machine frames and similar objects.

B86-10272

NON-BACK-DRIVABLE, FREEWHEELING COUPLING

W. LLEWELLIN (Martin Marietta Corp.)

May 1986

MSC-20475

Vol. 10, No. 3, P. 112

Cables reeled in and out with less risk of tangling. Opposing teeth engage with clockwise rotation and disengage with clockwise rotation of crank. Driving plate moves axially with respect to driven plate on ball points to engage and disengage. Clutch developed for reeling and unreeling tether line used to link astronaut to space vehicle. Allows line pulled out freely and helps to prevent line from tangling in reel housing when crank is turned backward. New clutch concept also applicable to fishing reels, toys, and safety-line mechanisms.

B86-10273

EFFECTS OF GEAR-CUTTER GEOMETRY ON PERFORMANCE

D. FOLENTA (Transmission Technology Co., Inc.)

May 1986

LEW-14243

Vol. 10, No. 3, P. 114

Bending stress reduced by improving tooth-fillet design. Using optimized gear-cutter design technology, gear designer reduces bending stresses by up to 20 percent. Reduction in bending stress is result of improved geometry of tooth fillet, which, in turn, results in significant improvement in horsepower-per-pound ratio. Gears run quieter and smoother than spur-gear system.

B86-10274

HIGH-SPEED PROPELLER FOR AIRCRAFT

D. A. SAGERSER, and B. S. GATZEN (Div. of United Technologies Inc.)

May 1986 See Also NASA TM-83736, N84-29878/NSP

LEW-14241

Vol. 10, No. 3, P. 115

Engine efficiency increased. Propeller blades required to be

quite thin and highly swept to minimize compressibility losses and propeller noise during high-speed cruise. Use of 8 or 10 blades with high-propeller-power loading allows overall propeller diameter to be kept relatively small. Area-ruled spinner and integrated nacelle shape reduce compressibility losses in propeller hub region. Finally, large modern turboshaft engine and gearbox provide power to advanced propeller. Fuel savings of 30 to 50 percent over present systems anticipated. Propfan system adaptable to number of applications, such as highspeed (subsonic) business and general-aviation aircraft, and military aircraft including V/STOL.

B86-10275

PUMP FOR SATURATED LIQUIDS

D. G. ELLIOTT (Caltech)

May 1986

NPO-16152

Vol. 10, No. 3, P. 117

Boiling liquids pumped by device based on proven components. Expanding saturated liquid in nozzle and diverting its phases along separate paths in liquid/vapor separator raises pressure of liquid. Liquid cooled in process. Pump makes it unnecessary to pressurize cryogenic liquids in order to pump them. Problems of introducing noncondensable pressurizing gas avoided.

B86-10276

RECEPTACLE FOR OPTICAL-FIBER SCRAPS

R. NEVIN (Lockheed Space Operations Co.)

May 1986

KSC-11326

Vol. 10, No. 3, P. 117

Small pieces of glass trapped by moving air. Device traps fibers in section of black air-conditioner filter material. Filter section rests on metal screen above axial fan, which pulls air down through filter. Fan is small, quiet unit of type ordinarily used to cool electronic equipment.

B86-10277

THERMALLY-INTEGRATED FUEL-CELL/ELECTROLYZER SYSTEMS

J. GAROW (United Technologies Corp.), K. MICHAELS (United Technologies Corp.), and R. MARTIN (United Technologies Corp.)

May 1986

LEW-14235

Vol. 10, No. 3, P. 118

New and more efficient method of thermally integrating fuel cell and electrolyzer designed. Design addresses thermal integration of fuel cell and water electrolyzer in regenerative fuel-cell system. System configuration provides thermal integration with single coolant loop. Configuration does not have thermal limitations associated with trying to transfer heat between two coolant loops. Design less complex and more reliable than prior designs. Adaptable to standalone power systems in conjunction with solar panels for remote-area applications.

B86-10278

HYDRAULIC ACTUATOR FOR GANGED CONTROL RODS

D. C. THOMPSON (Westinghouse Electric Corp.), and R. M. ROBEY (Westinghouse Electric Corp.)

May 1986

NPO-16503

Vol. 10, No. 3, P. 119

Hydraulic actuator moves several nuclear-reactor control rods in unison. Electromagnetic pump pushes liquid lithium against ends of control rods, forcing them out of or into nuclear reactor. Color arrows show lithium flow for reactor startup and operation. Flow reversed for shutdown. Conceived for use aboard spacecraft, actuator principle applied to terrestrial hydraulic machinery involving motion of ganged rods.

B86-10279

IGNITION SYSTEM FOR GASEOUS PROPELLANTS

R. A. PIERON (Rockwell International Corp.)
May 1986

MFS-29125

Vol. 10, No. 3, P. 120

Installation of spark plug in fuel-injection manifold of coaxial injector promotes more efficient cooling of combustor walls in rocket and turbine engines. After ignition occurs in fuel injector, combustion maintained in cooled main combustor leaving spark-plug tip in cool, clean environment. Eighteen tests have proven this injector design; no ignition failures occurred in 8,000 seconds of operation with gaseous oxygen and hydrogen. System also used with other propellants gaseous in ignition phase.

B86-10280

RIGID/COMPLIANT HELICOPTER ROTOR

P. JEFFERY (United Technologies Corp.)

May 1986 See Also N82/32341/NSP

ARC-11518

Vol. 10, No. 3, P. 121

Rotor structure ensures both effective aerodynamic support and efficient pitch changes. Four blades are shells with rigid inner I-beam arms integrated with rotor hub. Through each blade, control arm extends from pitch-control actuator in hub. Elastomeric bearings allow control arms to twist blades and thus change blade pitch without turning I-beam arms. Centrifugal force carried by tension strap. Leading and lagging movements of blades restrained by dampers. Ducts inside leading and trailing edges of blade shells carry air for partial cyclic aerodynamic control of lift and pitch. Structure permits more efficient pitch control with less weight. At same time, improves reliability through redundancy in supports and control mechanisms.

B86-10281

HELICOPTER PITCH-CONTROL MECHANISM REDUCES VIBRATION

H. LEMONT (United Technologies Corp.)

May 1986 See Also N82-32341/NSP

ARC-11513

Vol. 10, No. 3, P. 122

Large forces accommodated without increasing weight of helicopter structure. New mechanism yields stiffer control and improves accuracy of pitch changes under load. As result, heavy casting not for gearbox, nor extra reinforcing members needed for fuselage bulkheads, stringers, skin, and other parts. In new mechanism, reaction forces developed in rotor hub. Long load paths to gearbox and fuselage eliminated. Reaction member rigidly attached to hub and rotates with it. At lower end of reaction member, bearing forms bridge to fuselage through stationary beam and antirotation link. Beam connected to reaction plate through rods.

B86-10282

CONTROLLED-TEMPERATURE HOT-AIR GUN

M. C. MUNOZ (Rockwell International Corp.)

May 1986

MSC-20693

Vol. 10, No. 3, P. 123

Materials that find applications in wind tunnels first tested in laboratory. Hot-Air Gun differs from commercial units in that flow rate and temperature monitored and controlled. With typical compressed-air supply pressure of 25 to 38 psi (170 to 260 kPa), flow rate and maximum temperature are 34 stdft³/min (0.96 stdm³/min) and 1,090 degrees F (590 degrees C), respectively. Resembling elaborate but carefully regulated hot-air gun, setup used to apply blasts of air temperatures above 1,500 degrees F (815 degrees C) to test specimens.

B86-10283

ADJUSTABLE TOOLING FOR BENDING BRAKE

J. M. ELLIS

May 1986

MSC-20730

Vol. 10, No. 3, P. 124

Deep metal boxes and other parts easily fabricated. Adjustable tooling jig for bending brake accommodates spacing blocks and either standard male press-brake die or bar die. Holds spacer blocks, press-brake die, bar window die, or combination of three. Typical bending operations include bending of cut metal sheet into box and bending of metal strip into bracket with multiple inward 90 degree bends. By increasing free space available for bending sheet-metal parts jig makes it easier to fabricate such items as deep metal boxes or brackets with right-angle bends.

B86-10284

ORBITAL-TRANSFER VEHICLE WITH AERODYNAMIC BRAKING

C. D. SCOTT, K. NAGY, B. B. ROBERTS, R. C. RIED, K. KROLL, and J. GAMBLE

May 1986

MSC-20921

Vol. 10, No. 3, P. 125

Vehicle includes airbrake for deceleration into lower orbit. Report describes vehicle for carrying payloads between low and high orbits around Earth. Vehicle uses thin, upper atmosphere for braking when returning to low orbit. Since less propellant needed than required for full retrorocket braking, vehicle carries larger payload and therefore reduces cost of space transportation.

B86-10285

ALGORITHM FOR CALIBRATING ROBOT ARMS

S. A. HAYATI (Caltech), and M. MIRMANI (California State University, Los Angeles)

May 1986

NPO-16569

Vol. 10, No. 3, P. 126

Robots made to less demanding specifications and yet be more accurate. Method, described in published paper, used on any serial-link robot with any combination of revolute and prismatic joints. Increases accuracy of positioning manipulator at any point in workspace relative to fixed coordinate system. Accurate absolute positioning capability particularly useful for those tasks where robot is issued target location by external sensory devices, such as vision system. With new method, ultraprecise manufacturing and high-resolution measurements of robot components unnecessary. Method therefore reduces cost of robots in addition to increasing robot accuracy.

B86-10286

OVERCOMING ROBOT-ARM JOINT SINGULARITIES

L. K. BARKER, and J. A. HOUCK

May 1986 See Also N85-15446/NSP

LAR-13415

Vol. 10, No. 3, P. 126

Kinematic equations allow arm to pass smoothly through singular region. Report discusses mathematical singularities in equations of robotarm control. Operator commands robot arm to move in direction relative to its own axis system by specifying velocity in that direction. Velocity command then resolved into individual-joint rotational velocities in robot arm to effect motion. However, usual resolved-rate equations become singular when robot arm is straightened.

B86-10287

THEORY AND TESTS OF TWO-PHASE TURBINES

D. G. ELLIOTT (Caltech)

May 1986 See Also NASA CR-168834

NPO-16039

Vol. 10, No. 3, P. 126

New turbines open possibility of new types of power cycles. Report describes theoretical analysis and experimental testing of two-phase impulse turbines. Such turbines open possibility of new types of power cycles operating with extremely wet mixtures of steam and water, organic fluids, or immiscible liquids and gases. Possible applications are geothermal power, waste-heat recovery,

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refrigerant expansion, solar conversion, transportation, and engine-bottoming cycles.

B86-10288

CRASH TESTS OF PROTECTIVE AIRPLANE FLOORS

H. D. CARDEN

May 1986 See Also N85-13267/NSP

LAR-13414

Vol. 10, No. 3, P. 127

Energy-absorbing floors reduce structural buckling and impact forces on occupants. 56-page report discusses crash tests of energy-absorbing aircraft floors. Describes test facility and procedures; airplanes, structural modifications, and seats; crash dynamics; floor and seat behavior; and responses of anthropometric dummies seated in airplanes. Also presents plots of accelerations, photographs and diagrams of test facility, and photographs and drawings of airplanes before, during, and after testing.

B86-10339

DYNAMIC TOOTH LOADS FOR SPUR GEARS

R. CORNELL (United Technologies Corp.), and W. WESTERVELT (United Technologies Corp.)

Jul. 1986

LEW-14099

Vol. 10, No. 4, P. 74

Computer program developed using time-history, interactive, closedform solution for dynamic tooth loads for both low- and high-contact-ratio spur gears. Facilitates application of high-contact-ratio spur gear concepts. Program written in FORTRAN IV.

B86-10361

LIQUID SCAVENGER FOR SEPARATOR/PUMP

P. F. BERG (United Technologies Corp.)

Jul. 1986

MSC-20632

Vol. 10, No. 4, P. 92

Pump for hydrogen modified to remove moisture that condenses in impeller stage. Impeller-pump housing has circumferential groove leading to exit hole near high-pressure outlet. As impeller disk rotates, flings water droplets condensed in pump toward groove. Aerodynamic drag drives water around groove to exit hole.

B86-10362

CENTRALLY-RUPTURING SQUIB-CLOSURE DISKS

R. RICHTER (Caltech)

Jul. 1986

NPO-16707

Vol. 10, No. 4, P. 93

Rupture-disk design makes squib action more predictable. In new design, center of rupture disk contains cruciform indentation in which thickness reduced to about 0.5 mil (0.013 mm). Reduces strength of center of rupture disk in same manner as that of pull tabs on beverage cans; therefore, disk will fail predictably in center.

B86-10363

RETRACTABLE SUN SHADE

A. FRANK (Grumman Aerospace Corp.), S. F. DERESPINIS (Grumman Aerospace Corp.), and JOHN MOCKOVCIK, JR. (Grumman Aerospace Corp.)

Jul. 1986

MSC-21062

Vol. 10, No. 4, P. 94

Window-shade type spring roller contains blanket, taken up by rotating cylindrical frame and held by frame over area to be shaded. Blanket made of tough, opaque polyimide material. Readily unfurled by mechanism to protect space it encloses from Sun. Blanket forms arched canopy over space and allows full access to it from below. When shading not needed, retracted mechanism stores blanket compactly. Developed for protecting sensitive Space Shuttle payloads from direct sunlight while cargo-bay doors open. Adapted to shading of greenhouses, swimming pools, and boats.

B86-10364

DIRECTION-SENSITIVE LATCH

W. R. ACRES

Jul. 1986

MSC-20910

Vol. 10, No. 4, P. 95

Mechanism eliminates clearance and applies positive load latched to member. Simpler and lighter than previous direction-sensitive latches (also called 'vector-sensitive latches'). New mechanism well suited to operation by automatic control or by remote controlled manipulator. Stages of latching process begin with application of downward force to secondary member, causing it to displace roller. After secondary member has passed roller and joined primary member, actuator removes clearance between roller and secondary member.

B86-10365

MOBILE REMOTE MANIPULATOR

S. CORYELL (Grumman Aerospace Corp.), and R. E. OLSEN (Grumman Aerospace Corp.)

Jul. 1986

MSC-21051

Vol. 10, No. 4, P. 96

Turret, roll arm, and trolley enhance manipulator dexterity. Remote manipulator moves on trolley base along structure. Roll-axis arm positions manipulator arm so it can extend end effector under structure. Yaw-axis rotation gives added reach to arm above structure. Designed for handling, inspecting, and maintaining modules of space station. Manipulators having such capabilities useful on Earth; robots in manufacturing, erection of large structures, or performing complicated tasks in hazardous locations.

B86-10366

LIGHTWEIGHT MOTORIZED VALVE

R. GONZALEZ (Rockwell International Corp.), and J. VANDEWALLE (Parker-Hannifin Corp.)

Jul. 1986

MSC-20848

Vol. 10, No. 4, P. 97

Redesigned actuator assembly weighs 50 percent less. Isolator valve operated by ac motor instead of usual dc solenoid. Valve weighs only 3 lb (1.4 kg). New valve functions with either two-phase or three-phase power. Developed for isolating fluids in propellant tanks, manifolds, and interconnecting lines of Space Shuttle reaction control and orbital maneuvering subsystems, valve suited to applications in which leakage must be kept to minimum at high pressure differences - in petroleum and chemical processing.

B86-10367

HEAT PIPES REDUCE ENGINE-EXHAUST EMISSIONS

D. F. SCHULTZ

Jul. 1986

LEW-12590

Vol. 10, No. 4, P. 97

Increased fuel vaporization raises engine efficiency. Heat-pipe technology increased efficiency of heat transfer beyond that obtained by metallic conduction. Resulted in both improved engine operation and reduction in fuel consumption. Raw material conservation through reduced dependence on strategic materials also benefit from this type of heat-pipe technology. Applications result in improved engine performance and cleaner environment.

B86-10368

NEW ALLOY FOR GLASS-TO-METAL SEALS

A. J. SCHMUCK (McDonnell Douglas Corp.)

Jul. 1986

MSC-21023

Vol. 10, No. 4, P. 100

Coefficient of thermal expansion approximates that of glass more closely. Alloy composed of about 60 percent iron, 40 percent nickel, and traces of six other elements. Developed as replacement for Kovar Fe/Ni/Co alloy in ferrule-and-tube assembly, new alloy

has same strength, solderability, and compatibility with fuel as does Kovar. Used in glass-to-metal seals without excessive residual stresses. Potential for other applications in which low thermal expansion important; mechanical measuring devices and precise sliding parts that must function over wide temperature ranges.

B86-10369**TORQUE-SUMMING BRUSHLESS MOTOR**

J. G. VAIDYA (Sundstrand Advanced Technology Group)

Jul. 1986

MSC-20986

Vol. 10, No. 4, P. 100

Torque channels function cooperatively but electrically independent for reliability. Brushless, electronically-commutated dc motor sums electromagnetic torques on four channels and applies them to single shaft. Motor operates with any combination of channels and continues if one or more of channels fail electrically. Motor employs single stator and rotor and mechanically simple; however, each of channels electrically isolated from other so that failure of one does not adversely affect others.

B86-10370**CLEANING HIGH-VOLTAGE EQUIPMENT WITH CORNCOB GRIT**

C. CAVENESS (Rockwell International Corp.)

Jul. 1986

MSC-20180

Vol. 10, No. 4, P. 101

High electrical resistance of particles makes power shutdown unnecessary. New, inexpensive method of cleaning high-voltage electrical equipment uses plentiful agricultural product - corncob grit. Method removes dirt and debris from transformers, circuit breakers, and similar equipment. Suitable for utilities, large utility customers, and electrical-maintenance services.

B86-10371**HYDRAULIC-LEAK DETECTOR FOR HIDDEN JOINTS**

G. E. ANDERSON (Rockwell International Corp.), and S. LOO (Rockwell International Corp.)

Jul. 1986

MSC-20783

Vol. 10, No. 4, P. 102

Slow leakage of fluid made obvious. Indicator consists of wick wrapped at one end around joint to be monitored. Wick absorbs hydraulic fluid leaking from joint and transmits to opposite end, located outside cover plate and visible to inspector. Leakage manifested as discoloration of outside end of wick. Indicator reveals leaks in hidden fittings on hydraulic lines. Fast inspection of joints without disassembly. Used in aerospace, petroleum, chemical, nuclear, and other industries where removing covers for inspection impossible, difficult, or time-consuming.

B86-10372**MEASURING CONTINUOUS-PATH ACCURACIES OF ROBOTS**

T. A. ALLISON (Rockwell International Corp.), and G. A. ARNOLD (Rockwell International Corp.)

Jul. 1986

MFS-29121

Vol. 10, No. 4, P. 102

Sensors yield data on deviation from predetermined path and speed. Accuracy and repeatability of continuous-path robot motion measured with new method. Determines ability of robot to maintain tool orientation. Used with any type of manipulator arm and with separate, coordinated part positioner. Noncontacting eddy-current sensors measure distance from tool to aluminum path plate as robot end effector moves tool at prescribed distance from plate. Flat, sloped, curved, and other shapes used for path plate.

B86-10373**CLEANING OF LIQUID N2O4**

G. R. PFEIFER (The Marquardt Co.)

Jul. 1986

MSC-20989

Vol. 10, No. 4, P. 103

Technique useful in reducing clogging of fluid lines. Metal nitrate impurities precipitated from N2O4 by cooling N2O4 in heat exchanger and passing through hydraulic pump. Precipitate removed by fine membrane filter. Technique developed for cleaning of liquid N2O4 adaptable to cleaning of variety of industrial fluids, including fuels.

B86-10374**TWO-ARM-MANIPULATOR CONTROLLER**

S. CORYELL (Grumman Aerospace Corp.), and R. E. OLSEN (Grumman Aerospace Corp.)

Jul. 1986

MSC-21049

Vol. 10, No. 4, P. 104

Shoulder harness allows wearer to control simultaneously and independently two remote manipulator arms and end effectors. Each manipulator arm would have 7 degrees of freedom. Two arm mechanisms of controller moved by operator's arms and hands. Remote manipulator, located elsewhere, responds to operator's arm and hand movements. Adjustable shoulder straps, waist belt, and leg straps hold harness securely on wearer. Mechanisms and harness allow operator to reach almost normally at control station.

B86-10375**TOXIC-WASTE DISPOSAL BY COMBUSTION IN CONTAINERS**

J. HOUSEMAN (Caltech), J. B. STEPHENS (Caltech), P. I. MOYNIHAN (Caltech), L. E. COMPTON (Caltech), and J. J. KALVINSKAS (Caltech)

Jul. 1986

NPO-16710

Vol. 10, No. 4, P. 106

Chemical wastes burned with minimal handling in storage containers. Technique for disposing of chemical munitions by burning them inside shells applies to disposal of toxic materials stored in drums. Fast, economical procedure overcomes heat-transfer limitations of conventional furnace designs by providing direct contact of oxygen-rich combustion gases with toxic agent. No need to handle waste material, and container also decontaminated in process. Oxygen-rich torch flame cuts burster well and causes vaporization and combustion of toxic agent contained in shell.

B86-10376**TOXIC-WASTE DISPOSAL BY DRAIN-IN-FURNACE TECHNIQUE**

L. E. COMPTON (Caltech), J. B. STEPHENS (Caltech), P. I. MOYNIHAN (Caltech), J. HOUSEMAN (Caltech), and J. J. KALVINSKAS (Caltech)

Jul. 1986

NPO-16579

Vol. 10, No. 4, P. 107

Compact furnace moved from site to site. Toxic industrial waste destroyed using furnace concept developed for disposal of toxic munitions. Toxic waste drained into furnace where incinerated immediately. In furnace toxic agent rapidly drained and destroyed in small combustion chamber between upper and lower layers of hot ceramic balls

B86-10377**NOZZLE EXTENSION FOR SAFETY AIR GUN**

H. N. ZUMBRUN, and DELWIN R. CROOM, JR.

Jul. 1986

LAR-13366

Vol. 10, No. 4, P. 108

New nozzle-extension design overcomes problems and incorporates original commercial nozzle, retaining intrinsic safety features. Components include extension tube, length of which made to suit application; adaptor fitting, and nozzle adaptor repinned to maintain original safety features. Design moves conical airstream to end of extension to blow machine chips away from operator.

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Nozzle-extension modification allows safe and efficient operation of machine tools while maintaining integrity of original safety-air-gun design.

B86-10378

COAL-BASED FUEL-CELL POWERPLANTS

J. F. FERRAL (Caltech), A. W. PAPPANO (Caltech), and C. N. JENNINGS (Caltech)

Jul. 1986

NPO-16543

Vol. 10, No. 4, P. 108

Report assesses advanced technology design alternatives for integrated coal-gasifier/fuel-cell powerplants. Various gasifier, cleanup, and fuelcell options evaluated. Evaluation includes adjustments to assumed performances and costs of proposed technologies where required. Analysis identifies uncertainties remaining in designs and most promising alternatives and research and development required to develop these technologies. Bulk of report summary and detailed analysis of six major conceptual designs and variations of each. All designs for plant that uses Illinois No. 6 coal and produces 675 MW of net power.

B86-10379

LIFETIMES AND RELIABILITIES OF BEVEL-GEAR DRIVE TRAINS

D. LEWICKI, J. COX, M. SAVAGE (University of Akron), and C. BRIKMANIS (University of Akron)

Jul. 1986 See Also N85-27227/NSP

LEW-14372

Vol. 10, No. 4, P. 109

Statistical methods used to predict system lifetimes from component lifetimes. Report shows how to use information to determine system life of drive train, using methods of probability and statistics. Presents life and reliability model for bevel-gear drive trains. Bevel-gear and support-bearing lives analyzed for each gear and bearing in drive train, with results statistically combined to produce system life for entire drive train. Numerical example included.

B86-10380

INTERCHANGEABLE TOOLS FOR REMOTE MANIPULATORS

J. C. CODY (SRS Technologies)

Jul. 1986

MFS-27125

Vol. 10, No. 4, P. 109

Report presents concepts and specifications for set of interchangeable end-effector tools used on remotely operated manipulator to work on satellites in orbit. Tools make urgent repairs, do routine maintenance, transfer fluids, construct and assemble satellites, and deploy and retract appendages. With modifications, tool concepts and systematic approach to tool design applicable to such terrestrial uses as industrial robots, manually operated tools, and safety equipment. Report discusses concept for tool-storage system that holds tools securely when not used but kept accessible to manipulator.

B86-10381

SOLAR THERMAL ROCKET PROPULSION

J. C. SERCEL (Caltech)

Jul. 1986

NPO-16654

Vol. 10, No. 4, P. 109

Paper analyzes potential of solar thermal rockets as means of propulsion for planetary spacecraft. Solar thermal rocket uses concentrated Sunlight to heat working fluid expelled through nozzle to produce thrust.

B86-10382

STUDIES OF PILOT-INDUCED OSCILLATION

B. G. POWERS

Jul. 1986 See Also N84-20566/NSP

ARC-11601

Vol. 10, No. 4, P. 110

Total In-Flight Simulator permits reliable evaluation of landing characteristics of aircraft with PIO. Report discusses simulation requirements for investigating PIO characteristics and includes evaluation of relative merits of simulators. Observations of interest to those studying landing characteristics of other aircraft and to those designing pilot-training programs.

B86-10383

PROPERTIES OF COMBUSTION GASES

J. D. WEAR, R. E. JONES, A. M. TROUT, and B. J. MCBRIDE

Jul. 1986 See Also N85-10064/NSP and N85-21168/NSP

LEW-14275

Vol. 10, No. 4, P. 110

New series of reports: First report lists data from combustion of ASTM Jet A fuel and dry air; second report presents tables and figures for combustion-gas properties of natural-gas fuel and dry air, and equivalent ratios.

B86-10461

CONTINUOUS REMOVAL OF COAL-GASIFICATION RESIDUE

EARL R. COLLINS, JR (Caltech), J. SUITOR (Caltech), and D. DUBIS (Caltech)

Sep. 1986

NPO-16605

Vol. 10, No. 5, P. 106

Continuous-flow hopper processes solid residue from coal gasification, converting it from ashes, cinders, and clinkers to particles size of sand granules. Unit does not require repeated depressurization of lockhopper to admit and release materials. Therefore consumes less energy. Because unit has no airlock valves opened and closed repeatedly on hot, abrasive particles, subjected to lesser wear. Coal-gasification residue flows slowly through pressure-letdown device. Material enters and leaves continuously. Cleanout door on each pressure-letdown chamber allows access for maintenance and emergencies.

B86-10462

EFFECTS OF STRUCTURAL FLEXIBILITY ON AIRCRAFT-ENGINE MOUNTS

W. H. PHILLIPS

Sep. 1986 See Also N84-16590/NSP

LAR-13305

Vol. 10, No. 5, P. 109

Analysis extends technique for design of widely used type of vibration-isolating mounts for aircraft engines, in which rubber mounting pads located in plane behind center of gravity of engine-propeller combination. New analysis treats problem in statics. Results of simple approach useful in providing equations for design of vibration-isolating mounts. Equations applicable in usual situation in which engine-mount structure itself relatively light and placed between large mass of engine and other heavy components of airplane.

B86-10463

SHOCK-ABSORBENT BALL-SCREW MECHANISM

OTTO A. HIRR, JR., and R. W. MENEELY

Sep. 1986

ARC-11366

Vol. 10, No. 5, P. 110

Actuator containing two ball screws in series employs Belleville springs to reduce impact loads, thereby increasing life expectancy. New application of springs increases reliability of equipment in which ball screws commonly used. Set of three springs within lower screw of ball-screw mechanism absorbs impacts that result when parts reach their upper and lower limits of movement. Mechanism designed with Belleville springs as shock-absorbing elements because springs have good energy-to-volume ratio and easily stacked to attain any stiffness and travel.

B86-10464**IMPROVED ORIFICE PLATE FOR SPRAY GUN**

W. CUNNINGHAM (Martin Marietta Corp.)

Sep. 1986

MFS-28110**Vol. 10, No. 5, P. 111**

Erratic spray pattern of commercial spray gun changed to repeatable one by simple redesign of two parts. In modified spray gun orifice plate and polytetrafluoroethylene bushing redesigned to assure centering and alignment with nozzle. Such improvement useful in many industrial applications requiring repeatable spray patterns. Might include spraying of foam insulation, paint, other protective coatings, detergents, abrasives, adhesives, process chemicals, or fuels. Unmodified spray gun produces erratic spray because lateral misalignment between orifice plate and nozzle.

B86-10465**FLOW INJECTOR WOULD KEEP SLURRY FROM SETTLING**

E. V. LEWIS (Caltech)

Sep. 1986

NPO-16186**Vol. 10, No. 5, P. 112**

Ring nozzle helps to prevent choking of coal-slurry pipelines. Intended originally for use in coal mines, nozzle concept generally applicable to short-haul slurry pipelines where high-pressure water (or other slurry fluid) available. Extra water injected into flow near wall of slurry pipe to keep slurry particles from setting and blocking pipe.

B86-10466**LIQUID/GAS VORTEX SEPARATOR**

B. G. MORRIS

Sep. 1986

MSC-21058**Vol. 10, No. 5, P. 112**

Liquid/gas separator vents gas from tank of liquid that contains gas randomly distributed in bubbles. Centrifugal force separates liquid and gas, forcing liquid out of vortex tube through venturi tube. Gas vented through exhaust port. When liquid detected in vent tube, exhaust port closed, and liquid/gas mixture in vent tube drawn back into tank through venturi.

B86-10467**AUTOMATED ROTATING-MACHINERY ANALYSIS**

J. CLARK (Rockwell International Corp.)

Sep. 1986

MFS-19912**Vol. 10, No. 5, P. 113**

Computer-controlled automatic system processes accelerometer data from rotating machines, producing mathematical description and graphical display of shaft motion. Program saves processing time, readily identifies type of motion (circular, looped, or elliptical), provides annotated assessments to assist in failure analysis, alerts user to look for distinctive characteristics of machinery, and creates informative plots.

B86-10468**BIDIRECTIONAL, AUTOMATIC COAL-MINING MACHINE**

EARL R. COLLINS, JR. (Caltech)

Sep. 1986

NPO-15860**Vol. 10, No. 5, P. 116**

Proposed coal-mining machine operates in both forward and reverse directions along mine face. New design increases efficiency and productivity, because does not stop cutting as it retreats to starting position after completing pass along face. To further increase efficiency, automatic miner carries its own machinery for crushing coal and feeding it to slurry-transport tube. Dual-drum mining machine cuts coal in two layers, crushes, mixes with water, and feeds it as slurry to haulage tube. At end of pass, forward drum raised so it becomes rear drum, and rear drum lowered, becoming forward drum for return pass.

B86-10469**HEAT RADIATORS FOR ELECTROMAGNETIC PUMPS**

R. J. CAMPANA (GA Technologies, Inc.)

Sep. 1986

NPO-16458**Vol. 10, No. 5, P. 117**

Report proposes use of carbon/carbon composite radiators in electromagnetic coolant pumps of nuclear reactors on spacecraft. Carbon/carbon composite materials function well at temperatures in excess of 2,200 K. Aluminum has melting temperature of only 880 K.

B86-10470**LONG, THIN, DEPLOYABLE MAST**

L. A. FINLEY (Astro Research Corp.)

Sep. 1986

MFS-27088**Vol. 10, No. 5, P. 117**

Report describes 15-m-long deployable mast and discusses design and development that went into making product. Only 0.6 m long when stowed, mast extends itself to its full length. Although extended mast long and narrow, with aspect ratio of 67:1, it resists bending.

B86-10509**CIRCULATION-CONTROL VARIABLE-PITCH PROPELLER**

H. D. GARNER

Nov. 1986 See also N85-29959/NSP

LAR-12740**Vol. 10, No. 6, P. 74**

Circulation-control variable-pitch propeller has large lift value at moderate blowing coefficients. Based on circulation-control airfoil concept, has no moving parts other than needed for propeller rotation. Substituted for conventional variable-pitch propeller airfoil, lowers manufacturing costs, reduces maintenance, and improves reliability.

B86-10510**PITCH CONTROL FOR HELICOPTER ROTORS**

P. JEFFERY (United Technologies Corp.), and G. LUECKE (United Technologies Corp.)

Nov. 1986

ARC-11517**Vol. 10, No. 6, P. 76**

Pitch controller for helicopter rotors uses hub-mounted actuators located symmetrically between rotor blades. New controller designed for X-wing rotors requiring collective pitch control; pitch of all blades must be changed by same amount. Collective control allows rotor trimmed during variety of flight regimes, particularly during hovering and fixed-wing flight.

B86-10511**ALGORITHM FOR FUEL-CONSERVATIVE AIRPLANE DESCENTS**

C. E. KNOX, D. D. VICROY, and D. A. SIMMON (United Airlines, Inc.)

Nov. 1986 See also N83-25707/NSP, N84-29871/NSP and N85-26705/NSP

LAR-13492**Vol. 10, No. 6, P. 77**

Federal Aviation Administration implementing automated, time-based metering form of air-traffic control (ATC) with profile-descent procedures for arrivals into terminal area. Measures provide fuel savings by matching arrival of airplanes to airport acceptance rate through time-control computations and allowing pilot to descend at his discretion from cruise altitude to designated metering-fix altitude in idle-thrust clean configuration. Airborne descent algorithm developed compatible with time-based metering and profile-descent procedures and designed to improve accuracy of delivering airplane during fuel-efficient descent to metering fix at time designated by the ATC system.

07 MACHINERY

B86-10512

ANALYSIS OF LEAKAGE FLOWS IN TURBOMACHINERY

M. M. SINDIR (Rockwell International Corp.)

Nov. 1986

MFS-29152

Vol. 10, No. 6, P. 78

Navier-Stokes calculations predict leakage flow in high-pressure fuel pump. Accurate calculation of internal turbomachinery flow dynamics helps spot possible failure modes and establishes coupling between cyclic loading and structural dynamics. Approach also useful in analyzing two- and quasi-three-dimensional leakage flows in other turbomachinery components.

B86-10513

BALANCING HIGH-SPEED ROTORS AT LOW SPEED

J. GIORDANO (Mechanical Technology, Inc.), and E. ZORZI (Mechanical Technology, Inc.)

Nov. 1986

MFS-28130

Vol. 10, No. 6, P. 79

Flexible balancing reduces vibrations at operating speeds. Highspeed rotors in turbomachines dynamically balanced at fraction of operating rotor speed. New method takes into account rotor flexible rather than rigid.

B86-10514

FLEXIBLE-ROTOR BALANCING DEMONSTRATION

J. GIORDANO (Mechanical Technology, Inc.), and E. ZORZI (Mechanical Technology, Inc.)

Nov. 1986

MFS-28132

Vol. 10, No. 6, P. 80

Report describes method for balancing high-speed rotors at relatively low speeds and discusses demonstration of method on laboratory test rig. Method ensures rotor brought up to speeds well over 20,000 r/min smoothly, without excessive vibration amplitude at critical speeds or at operating speed.

B86-10515

LIQUID-HYDROGEN POLYGENERATION SYSTEM

P. MINDERMAN, G. GUTKOWSKI, L. MANFREDI, J. KING, and F. HOWARD

Nov. 1986

KSC-11304

Vol. 10, No. 6, P. 80

Polygeneration system uses existing technology in integrated process to produce liquid hydrogen space-vehicle propellant and secondary products as gaseous nitrogen, electrical energy, and thermal energy. Makes commercial launch services economical. Lowers expected cost of liquid hydrogen by utilizing relatively cheap coal feedstocks and by reducing electrical costs associated with producing liquid hydrogen.

B86-10516

SYNOPSIS OF MAGNETOHYDRODYNAMIC POWER GENERATION

J. L. SMITH

Nov. 1986 See Also N84-25458/NSP

MFS-27073

Vol. 10, No. 6, P. 81

Concise summary of magnetohydrodynamic (MHD) theory, history, and future trends presented in report. Worldwide research on MHD covered, and selected data from key research projects included. Magnetohydrodynamic generator produces electric current by passing fluid at high speed through strong magnetic field. Fluid ionized gas, plasma, or liquid metal. Magnetohydrodynamic generators offer potential for high efficiency, low power cost, and cleaner emissions.

B86-10531

ADVANCED ROTORDYNAMIC NONLINEAR TRANSIENT SIMULATION

D. G. BECHT (Rockwell International Corp.)

Nov. 1986

MFS-19939

Special Edition, P. 40

Advanced rotordynamic nonlinear transient-simulation program, TRANSIM, developed to predict response of high-performance rotating machinery to variety of forcing functions. Works by modal superposition of rotor and casing subsystems. Transient response of system calculated by numerical integration of equations of motion, performed in modal coordinates. Resulting data transformed back into physical coordinates as required to determine user-requested loads and accelerations as function of time. Used to analyze Space Shuttle main engine high-pressure fuel turbopump. TRANSIM written in FORTRAN 77.

B87-10022

EVALUATING PERFORMANCES OF SOLAR-ENERGY SYSTEMS

L. D. JAFFE (Caltech)

Jan. 1987

NPO-16717

Vol. 11, No. 1, P. 46

CONC11 computer program calculates performances of dish-type solar thermal collectors and power systems. Solar thermal power system consists of one or more collectors, power-conversion subsystems, and powerprocessing subsystems. CONC11 intended to aid system designer in comparing performance of various design alternatives. Written in Athena FORTRAN and Assembler.

B87-10034

AIR-POWERED PROJECTILE LAUNCHER

T. ANDREWS (Caltech), R. A. BJORKLUND (Caltech), D. G. ELLIOTT (Caltech), and L. K. JONES (Caltech)

Jan. 1987

NPO-16763

Vol. 11, No. 1, P. 62

Air-powered launcher fires plastic projectiles without using explosive propellants. Does not generate high temperatures. Launcher developed for combat training for U.S. Army. With reservoir pressurized, air launcher ready to fire. When pilot valve opened, sleeve (main valve) moves to rear. Projectile rapidly propelled through barrel, pushed by air from reservoir. Potential applications in seismic measurements, avalanche control, and testing impact resistance of windshields on vehicles.

B87-10035

EASY-TO-INSTALL LINK FOR TRACK TREADS

EARL R. COLLINS, JR. (Caltech)

Jan. 1987

NPO-16322

Vol. 11, No. 1, P. 63

Link with integral tapered pins proposed as means of joining treads on tracked vehicles. Proposed link saves assembly and maintenance time. Dual pins on link fit into pair of holes on adjacent tread shells. Pins secured by locking clip pressed into grooves on pins.

B87-10036

MORE DURABLE TRACKS FOR HEAVY VEHICLES

EARL R. COLLINS, JR. (Caltech)

Jan. 1987

NPO-16478

Vol. 11, No. 1, P. 64

Tie bars instead of threaded fasteners make track throwing less likely. Proposed undercarriage for tank or bulldozer has flanged edges to prevent rocks and other road debris from getting caught in track drive and damaging or casting off track. Improved track has no threaded fasteners to be loosened by road shock and vibration. Continuous chain of floating guide bars articulated at web junctions. Pins replace bolted connections. Guide bars and flanges on vehicle keep out stones.

B87-10037**REMOTELY ADJUSTABLE HYDRAULIC PUMP**H. H. KOUNS (Abex Corp.), and L. D. GARDNER (Abex Corp.)
Jan. 1987**MSC-21007****Vol. 11, No. 1, P. 65**

Outlet pressure adjusted to match varying loads. Electrohydraulic servo has positioned sleeve in leftmost position, adjusting outlet pressure to maximum value. Sleeve in equilibrium position, with control land covering control port. For lowest pressure setting, sleeve shifted toward right by increased pressure on sleeve shoulder from servovalve. Pump used in aircraft and robots, where hydraulic actuators repeatedly turned on and off, changing pump load frequently and over wide range.

B87-10038**HOT-AIR-PULSE GENERATOR**

M. C. AMMERMAN (Rockwell International Corp.)

Jan. 1987

MSC-20768**Vol. 11, No. 1, P. 66**

Mixer blades interrupt airflow for rapid testing of insulating materials. Device for producing periodic blasts of heated air used for rapid testing of flexible insulating materials. Used to compare materials and to select candidates for more detailed testing in wind tunnels.

B87-10039**BLADE-TIP-CLEARANCE FORCES IN TURBINES**M. MARTINEZ-SANCHEZ (Massachusetts Institute of Technology),
and E. M. GREITZER (Massachusetts Institute of Technology)

Jan. 1987 See Also N85-29963/NSP

MFS-27122**Vol. 11, No. 1, P. 67**

Study reviews field and proposes experiments. Report summarizes present knowledge and discusses plans for experiments on blade-tip-clearance excitation forces in turbines. Of particular interest Alford forces, named after pioneering worker in this field. These are cross forces due to uneven clearances, which in turn caused by and also cause rotor vibrations. Because blade-tip clearances affect turbine efficiency and excitation forces affect rotor stability, report proves useful to researchers and designers of advanced turbomachinery.

B87-10079**COMPUTING JET-EXHAUST/CROSSFLOW INTERACTIONS**S. C. PERKINS, JR. (Nielsen Engineering and Research, Inc.),
and M. MENDENHALL (Nielsen Engineering and Research, Inc.)

Feb. 1987

ARC-11597**Vol. 11, No. 2, P. 58**

JETPLT and JETBOD programs developed to predict velocity and pressure induced by subsonic jets exhausting into subsonic free stream. JETPLT predicts pressures induced on infinite flat plate by jet exhausting at angles to plate. JETBOD, in conjunction with panel code, predicts pressures induced on body of revolution by jet exhausting perpendicularly to surface. Programs used to investigate interactions between jet exhausts and crossflows in vertical/short-takeoff-and-landing aircraft shifting from hover to forward flight, where induced pressure loading leads to reduction in lift. JETPLT/JET-BOD written in FORTRAN 77.

B87-10087**HEAT-EXCHANGER/HEAT-PIPE INTERFACE**H. J. SNYDER (GA Technologies, Inc.), and T. H. VAN HAGAN
(GA Technologies, Inc.)

Feb. 1987

NPO-16456**Vol. 11, No. 2, P. 66**

Monolithic assembly reliable and light in weight. Heat exchanger and evaporator ends of heat pipes integrated in monolithic halves welded together. Interface assembly connects heat exchanger of furnace, reactor, or other power source with heat pipes carrying

heat to radiator or power-consuming system. One of several concepts proposed for nuclear power supplies aboard spacecraft, interface useful on Earth in solar thermal power systems, heat engines, and lightweight cooling systems.

B87-10088**CHANGES IN BLADE CONFIGURATION IMPROVE TURBOPUMP**S. Y. MENG (Rockwell International Corp.), and G. E. BACHE
(Rockwell International Corp.)

Feb. 1987

MFS-29176**Vol. 11, No. 2, P. 67**

Cavitation reduced while suction increased. Tests conducted with model liquid-oxygen turbopump using water as pumped fluid confirms performance improved by 'tandem' arrangement of blades. Findings expected to apply to other pumps having two adjacent rotor rows.

B87-10089**ONE-DIMENSIONAL SIMULATION OF ISOTROPIC RADIATION**

B. E. ANSPAUGH (Caltech), and R. G. DOWNING (Caltech)

Feb. 1987

NPO-16412**Vol. 11, No. 2, P. 67**

Solar cells tested for effects of radiation in unidirectional beam. Cam groove imparts cosecant-function velocity to solar cells on rotating target plate. Cells on stationary plate above rotating one absorb steady perpendicular radiation from test source.

B87-10090**TRANSLATING CANARD**

L. P. YIP, R. D. ROBINSON, and J. L. JOHNSON

Feb. 1987

LAR-13498**Vol. 11, No. 2, P. 68**

Longitudinal trim control augmented when landing flaps deployed. Translating canard provides automatic pitch trim for wing-flap system while maintaining stable pitch break.

B87-10091**MECHANIZED POLISHING OF OPTICAL ROD AND FIBER ENDS**

J. S. GUM

Feb. 1987

GSC-12917**Vol. 11, No. 2, P. 69**

Workpiece holder for standard grinding and polishing machine makes it easier to produce optical finish and shape on end of metal or glass rod or bundle of optical fibers. Previously, glass parts lapped and polished manually, time-consuming procedure calling for considerable skill.

B87-10092**ARRAY OF SHAPED HEAT PIPES**

A. KIRPICH (General Electric Co.)

Feb. 1987

NPO-16445**Vol. 11, No. 2, P. 70**

Heat distributed evenly over cone. Each heat pipe in conical array tapered to increase width of radiating outer surface with increasing distance toward base of cone. Heat flux delivered to all parts of conical surface more nearly uniform. Heat-pipe concept applicable to solar-energy and other terrestrial systems requiring spatially controlled distribution of large heat fluxes.

B87-10093**BRAKING SYSTEM FOR WIND TURBINES**

J. E. KRYSIAK, and F. E. WEBB

Feb. 1987

LEW-14337**Vol. 11, No. 2, P. 71**

Operating turbine stopped smoothly by fail-safe mechanism. Windturbine braking systems improved by system consisting of two large steel-alloy disks mounted on high-speed shaft of gear box, and brakepad assembly mounted on bracket fastened to top of gear box. Lever arms (with brake pads) actuated by spring-powered, pneumatic cylinders connected to these arms. Springs give specific spring-loading constant and exert predetermined load onto brake pads through lever arms. Pneumatic cylinders actuated positively to compress springs and disengage brake pads from disks. During power failure, brakes automatically lock onto disks, producing highly reliable, fail-safe stops. System doubles as stopping brake and 'parking' brake.

B87-10094**MECHANISM FOR RETRIEVING SATELLITES FROM ORBIT**

W. D. HARWELL, and D. A. GARDNER

Feb. 1987

MSC-20979**Vol. 11, No. 2, P. 71**

Pair of documents describe mechanism allowing astronaut to capture in extravehicular activity small artificial satellite for retrieval and return to Earth. Mechanism operates by insertion of probe in nozzle of rocket motor on satellite, followed by expansion of inserted probe end to grasp motor inside nozzle and thereby capture satellite. Designed for specific satellite, but operating principle adapted to almost any satellite equipped with rocket motor or possibly used in retrieval of hollow-shaped objects in marine and other salvage operations.

B87-10129**ANALYSIS OF SCRAMJET INLETS**

A. KUMAR

Mar. 1987

LAR-13297 LAR-13559**Vol. 11, No. 3, P. 42**

NASCRIIN program analyzes two-dimensional flow fields in supersonic combustion ramjet (scramjet) inlets. Solves two-dimensional Euler or Navier-Stokes equations in conservative form by unsplit, explicit, two-step finite-difference method. More recent explicit/implicit, two-step scheme incorporated by analysis of viscous flow. Algebraic, two-layer eddy-viscosity model used for turbulent-flow calculations. Vectorized version, written for CDC CYBER 205, whereas scalar version, can be run on CRAY or other scalar computers.

B87-10143**MAGNETIC BEARING WITH RADIAL AND ANGULAR CONTROL**

P. A. STUDER

Mar. 1987

GSC-12957**Vol. 11, No. 3, P. 62**

Active magnetic bearing stably levitates rotor against radial (lateral) and axial motion and points rotor axis in controllable direction, yet allows rotor to turn freely about own axis. Rotor only moving part, and absence of mechanical contact between rotor and stator assures long life. Active magnetic bearing includes electromagnet coils tilting rotor clockwise or counterclockwise, or move it right or left. Feedback control system maintains rotor at equilibrium radial and angular positions in response to signals from position sensors. No active control needed to maintain equilibrium axial position. Adjustable magnetic bearing useful in high-speed rotating devices, robotic joints, and supports for optical elements.

B87-10144**THREE-AXIS ATTITUDE CONTROL WITH A SINGLE WHEEL**

P. A. STUDER

Mar. 1987

GSC-12970**Vol. 11, No. 3, P. 63**

Single-device attitude-control system provides stabilization along three axes. Flywheel connected to electronically controlled motor

rotates on magnetic bearing. At high rotational speed, small angular displacements about x and y axes, in response to control signals enable storage of relatively large amounts of angular momentum. Angular momentum about z axis stored in changes in rotational speed.

B87-10145**SWITCHING CIRCUIT FOR SHOP VACUUM SYSTEM**

R. K. BURLEY (Rockwell International Corp.)

Mar. 1987

MFS-29153**Vol. 11, No. 3, P. 64**

No internal connections to machine tools required. Switching circuit controls vacuum system draws debris from grinders and sanders in machine shop. Circuit automatically turns on vacuum system whenever at least one sander or grinder operating. Debris safely removed, even when operator neglects to turn on vacuum system manually. Pickup coils sense alternating magnetic fields just outside operating machines. Signal from any coil or combination of coils causes vacuum system to be turned on.

B87-10146**CHARACTERISTICS AND APPLICATIONS OF METAL HYDRIDES**

G. J. EGAN (Hydrogen Consultants, Inc.), and F. E. LYNCH (Hydrogen Consultants, Inc.)

Mar. 1987

MFS-26028**Vol. 11, No. 3, P. 65**

Report discusses engineering principles of uses of metal hydrides in spacecraft. Metal hydrides absorb, store, pump, compress, and expand hydrogen gas. Additionally, they release or absorb sizeable amounts of heat as they form and decompose - properly adapted for thermal-energy management or for propulsion. Describes efforts to: Identify heat sources and sinks suitable for driving metal hydride thermal cycles in spacecraft; develop concepts for hydride subsystems employing available heating and cooling methods; and produce data base on estimated sizes, masses, and performances of hydride devices for spacecraft.

B87-10147**RESIDENTIAL PHOTOVOLTAIC/THERMAL ENERGY SYSTEM**

M. K. SELCUK (Caltech)

Mar. 1987

NPO-15013**Vol. 11, No. 3, P. 66**

Proposed system supplies house with both heat and electricity. Pair of reports describes concept for self-sufficient heating, cooling, and power-generating system for house. Panels on walls of house provide hot water, space heating, and heat to charge heat-storage system, and generate electricity for circulation pumps and fans. Roof panels generate electricity for household, operate heat pump for summer cooling, and provide supplementary winter heating via heat pump, using solar-cell cooling-fluid loop. Wall and roof panels used independently.

B87-10148**POSITION CONTROL FOR NON-LINEAR, MULTIPLE-LINK ROBOTS**

H. SERAJI (Sandia National Laboratories), and M. M. MOYA (Sandia National Laboratories)

Mar. 1987

NPO-16806**Vol. 11, No. 3, P. 66**

Several approaches to complicated control problem examined. Report surveys methods for controlling motion of robot manipulators. Applies to coupled, highly nonlinear multiple-link robots. Presents adaptive control technique based on discrete linear model of robot arm, obtained by linearizing nonlinear dynamical equations about nominal trajectory. Parameters of model calculated with adaptive parameter-identification algorithm. Based on system

model, optimal control input computed using position and velocity feedback.

B87-10188
SIMULATING FLEXIBLE-SPACECRAFT DYNAMICS AND CONTROL

JOSEPH FEDOR (AVCO Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13006

Vol. 11, No. 4, P. 48

Versatile program applies to many types of spacecraft and dynamical problems. Flexible Spacecraft Dynamics and Control program (FSD) developed to aid in simulation of large class of flexible and rigid spacecraft. Extremely versatile and used in attitude dynamics and control analysis as well as in-orbit support of deployment and control of spacecraft. Applicable to inertially oriented spinning, Earth-oriented, or gravity-gradient-stabilized spacecraft. Written in FORTRAN 77.

B87-10198
REMOVING WELDING FUMES

LLOYD J. MOORE, and VANDEL L. HALL

Apr. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MFS-28106

Vol. 11, No. 4, P. 64

Portable exhaust duct for machining and welding shops removes oil mist, dust, smoke, and fumes. Duct used with shop exhaust system, inlets of which placed at various convenient locations in shop floor. Flanged connector on underside of wheeled base links flexible tube to exhaust system under floor. Made especially for welding in room with low ceiling.

B87-10199
CALCULATING LEAKAGE AROUND TURBOPUMP INDUCER SHROUDS

SEN YIH MENG (Rockwell International Corp.), and MUNIR M. SINDIR (Rockwell International Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29106

Vol. 11, No. 4, P. 65

New mathematical model for leakage flow around shrouded turbopump inducers yields more realistic analyses from which designers determine best geometry for leakage-flow-reinjection ports. Also, designers use calculated velocity profile at inducer leading edge to determine blade-angle distribution of inducer leading edge.

B87-10200
STABILITY/INSTABILITY ANALYSIS OF ROTATING MACHINERY

RICHARD W. POWERS (Rockwell International Corp.)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29168

Vol. 11, No. 4, P. 66

Numerical index of stability calculated for nonlinear system. Technique for determining rotor stability or instability from analysis of measurements adapted for use with computer simulations of rotor motion. Involves calculation of log decrement or increment of vibration amplitude. Applicable to rotors mounted in loose bearings and to similar problems in which load-versus-deflection characteristics nonlinear. Developed for assessments of vibrational characteristics of turbopump rotors, technique also usable with such mechanisms as high-speed ball bearings.

B87-10201
BENDABLE ROUTING TOOL

WALTER MAYER (Rockwell International Corp.)

Apr. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MFS-29179

Vol. 11, No. 4, P. 67

Tool extends routing bit into internal cavities or passages so burrs and similar defects removed. Bent so inserted through curving channels. Copper sheath gives stiffness to flexible shaft but can itself be bent. Several types of routing bits attached to shaft.

B87-10202
PIEZOELECTRIC DRIVER FOR INCREMENTAL MOTION

JOSEPH R. BRUMAN (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16751

Vol. 11, No. 4, P. 68

Vibrating device containing two piezoelectric ceramic slabs acts as mechanical driver. Eventually substitutes for small continuous or stepping electric motors of slow to moderate speeds. Piezoelectric driver simple in construction, requires no precise dimensions, inexpensive to make, and needs no lubrication. Not damaged by stalling or overloads and safe for use in explosive atmospheres; Motion controllable in micron-size increments, and holds position when power turned off. Potential applications as positioner or mover. Used to position instrument pointers, antennas, or solar panels; to focus lenses; or operate tuners, recording instruments, or valves.

B87-10203
GRASPING MECHANISM

W. NEIL MYERS, and JOHN C. FORBES

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28161

Vol. 11, No. 4, P. 70

Grasping mechanism captures and locks onto rodlike handle without being precisely aligned with it initially. Mechanism includes two faceplates and three rotatable fingers meshing odd finger between two members of opposite finger pair. Power for fingers supplied by motor powered via harmonic drive reduces speed and increases torque by factor of 160.

B87-10204
HEAT SHIELDS FOR AEROBRAKES

W. C. PITTS, and M. S. MURBACH (Informatics General Corporation)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11681

Vol. 11, No. 4, P. 71

Performances of three types of heat protectors predicted. Estimates of expected performances of heat shields for conical drag brake presented in paper. Drag brakes, or aerobrakes, being considered as devices for slowing space vehicles when they return to Space Shuttle altitudes from higher satellite altitudes after supply missions. Aerobrakes add less weight than do retro-rockets for same purpose and consume no fuel. Paper provides general information on sensitivity of performance to thermal and physical properties of materials used in aerobrakes. Information useful to both designers of brakes and developers of materials for brake fabrication on aerospace structures.

B87-10238
FUEL/AIR PREMIXING SYSTEM

E. EKSTEDT (General Electric Co.)

May 1987 Additional information available through: NTIS,

07 MACHINERY

Springfield, VA 22161, (TEL: 703-487-4650) (N84-15151/NSP)
LEW-13953 Vol. 11, No. 5, P. 58

Fuel and air mixed thoroughly within short distance. In new, simplified system, centrally located fuel injector combined with perforated plate mounted on premixing-duct inlet. Plate causes some fuel spray to move radially outward while mixing with air. Hole patterns in plate designed to enhance even burning and prevent excess fuel from reaching chamber walls. Uniform fuel/air distribution results in improved operation and efficiencies in minimum-length combustor systems.

B87-10239 **EFFICIENT VENT UNLOADING OF AIR COMPRESSORS**

ALVIN J. MUHONEN (Boeing Services International, Inc.)
May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11299 Vol. 11, No. 5, P. 58
Method for unloading one-and two-stage reciprocating air compressors increases energy efficiency and inhibits deterioration of components. In new unloader configuration, compressor vented to atmosphere on downstream side. Method implemented expeditiously as modification of existing systems.

B87-10240 **GETTER CAPSULES FOR HEAT-TRANSPORT SYSTEMS** BENJAMIN SEIDENBERG

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12922 Vol. 11, No. 5, P. 60
Metal absorbs hydrogen dissolved in heat-transfer fluids. Blockages by hydrogen gas in refrigerators, heat pipes, and other two-phase heat-transport systems eliminated by use of degassing metals or alloys called getters. Getter contained in getter capsule placed in series or in parallel with heat-transport loop. Gas-removal technique more specific and more reliable in solving problem of gas blockage than older procedures.

B87-10241 **SPOT PAINT SPRAYER**

J. ARTHUR LEIFSEN (Grumman Aerospace Corp.)
May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MSC-21080 Vol. 11, No. 5, P. 61
Proposed atomizing system applies paint to small areas or objects - typically nuts, bolts, or other fasteners on flat surfaces. System used in electronic and mechanical assemblies, where small parts coated but not reached by normal spraying techniques. Coverage expected more complete than that obtained by hand brushing. Paint applicator contains two chambers in which flow of air and atomized paint controlled to ensure complete coating of fastener. In electrostatic version, inner tube serves as one electrode, while object coated serves as other electrode.

B87-10242 **HYDRAULIC FATIGUE-TESTING MACHINE**

JAMES D. HODO, DENNIS R. MOORE, THOMAS F. MORRIS, and NEWTON G. TILLER
May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28118 Vol. 11, No. 5, P. 62
Fatigue-testing machine applies fluctuating tension to number of specimens at same time. When sample breaks, machine continues to test remaining specimens. Series of tensile tests needed to determine fatigue properties of materials performed more rapidly than in conventional fatigue-testing machine.

B87-10243 **ROTARY DRIVE MECHANISM ACCEPTS TWO INPUTS** LARRY D. WEBSTER

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11325 Vol. 11, No. 5, P. 63
Mechanism connects two drives to single output shaft without clutches or planetary gears. More reliable than clutch-based two-drive mechanism and less bulky than planetary mechanism. Moreover, designed for any ratio of output to input speed, including an 1:1 ratio, unlike planetary gears. Drives operate simultaneously or separately.

B87-10244 **SPRAY GUN WITH CONSTANT MIXING RATIO** WILLIAM G. SIMPSON

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MFS-28135 Vol. 11, No. 5, P. 64
Conceptual mechanism mounted in handle of spray gun maintains constant ratio between volumetric flow rates in two channels leading to spray head. With mechanism, possible to keep flow ratio near 1:1 (or another desired ratio) over range of temperatures, orifice or channel sizes, or clogging conditions.

B87-10245 **ALKALI METAL/SALT THERMAL-ENERGY-STORAGE SYSTEMS**

WAYNE W. PHILLIPS (Caltech), and JOHN W. STEARNS (Caltech)
May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16686 Vol. 11, No. 5, P. 66
Proposed thermal-energy-storage system based on mixture of alkali metal and one of its halide salts; metal and salt form slurry of two immiscible melts. Use of slurry expected to prevent incrustations of solidified salts on heat-transfer surfaces that occur where salts alone used. Since incrustations impede heat transfer, system performance improved. In system, charging heat-exchanger surface immersed in lower liquid, rich in halide-salt, phase-charge material. Discharging heat exchanger surface immersed in upper liquid, rich in alkali metal.

B87-10289 **FORCED-FLOW EVAPORATIVE COOLER**

WILBERT E. ELLIS (Sundstrand Corp.), and RICHARD E. NIGGEMANN
Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21078 Vol. 11, No. 6, P. 58
Evaporative cooler absorbs heat efficiently under unusual gravitational conditions by using centrifugal force and vapor vortices to maintain good thermal contact between heat-transfer surface and vaporizable coolant. System useful for cooling electronic or other equipment under low gravity encountered in spacecraft or under multiple-gravity conditions frequently experienced in high-performance airplanes.

B87-10290 **BLENDER FOR ANTIMISTING KEROSENE**

PRADIP G. PARIKH (Caltech), VIRENDRA SAROHA (Caltech), and ANDRE H. YAVROUIAN (Caltech)
Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16968**Vol. 11, No. 6, P. 59**

Blender continuously disperses controlled amount of flammability-reducing additive into stream of jet fuel. Resulting mixture consists of homogeneous suspension of additive polymer particles in fuel. Particles dissolve within 15 to 30 min, without agitation, forming airplane fuel known as antimisting kerosene which promises to reduce danger from fire in crashes.

B87-10291**FAULT DETECTION AND ISOLATION FOR HYDRAULIC CONTROL**

Innovator not given (Sunstrand Energy Systems)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20760**Vol. 11, No. 6, P. 60**

Pressure sensors and isolation valves act to shut down defective servochannel. Redundant hydraulic system indirectly senses failure in any of its electrical control channels and mechanically isolates hydraulic channel controlled by faulty electrical channel so that it cannot participate in operating system. With failure-detection and isolation technique, system can sustain two failed channels and still functions at full performance levels. Scheme useful on aircraft or other systems with hydraulic servovalves where failure cannot be tolerated.

B87-10292**SOLENOID VALVE WITH SELF-COMPENSATION**

FRITZ H. WOELLER, and YUTAKA MATSUMOTO

Jun. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

ARC-11620**Vol. 11, No. 6, P. 62**

New solenoid-operated miniature shutoff valve provides self-compensation of differential pressure forces that cause jamming or insufficient valve closure as in single-seal valves. Dual-seal valve is bidirectional. Valve simultaneously seals both inlet and outlet tubes by pressing single disk of silicone rubber against ends of both.

B87-10293**ACTIVE SUPPRESSION OF ROTOR VIBRATIONS**

ELISEO DIRUSSO

Jun. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

LEW-14488**Vol. 11, No. 6, P. 64**

In active rotor control, vibrations of flexibly supported rotors suppressed by use of electronic feedback control system. System senses vibration level of rotor system and, in turn, provides damping such that vibration level maintained within acceptable limits. Enables rotor to operate through and above its critical speeds, increases bearing life, reduces size and weight of rotating shafts, and generally enables rotors to operate more smoothly.

B87-10294**ADAPTING A ROBOT HAND TO SPECIALIZED FUNCTIONS**

KEITH H. CLARK

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-25949**Vol. 11, No. 6, P. 64**

Adaptor enables mechanical and electrical connections made easily between special-purpose end effector and arm of robot or remote manipulator. Use in prosthetic devices also contemplated. With adaptor, hand changed quickly from device designed to grasp objects of various sizes and shapes to device intended to do specific task efficiently.

B87-10295**EMERGENCY CONTROL FOR A CIRCULATION-CONTROL HELICOPTER ROTOR**

WILLIAM C. FISCHER (United Technologies Corp.), KENNETH C. ARIFIAN (United Technologies Corp.), and TOM H. LAWRENCE (United Technologies Corp.)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11605**Vol. 11, No. 6, P. 65**

Digital system gives pilot partial command when primary system fails. Emergency system provides digital control of rigid circulation-control rotor for experimental X-wing aircraft. In addition to centering collective-pitch control, new command provides limited roll control via collective pitch and gyroscopic decoupling in pitch and aerodynamic decoupling.

B87-10296**REFRIGERATOR BASED ON CHEMISORPTION**

JACK A. JONES (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16734**Vol. 11, No. 6, P. 66**

Reversible chemical reaction generates pressurized oxygen for cooling. Concept for cryogenic refrigerator based on chemical absorption of oxygen by praseodymium/cerium oxide (PCO) compound. Refrigerator produces cryogenic liquid for cooling infrared sensors. Also used for liquefying air and separating oxygen from nitrogen in air. In chemisorption refrigerator, PCO alternately absorbs and desorbs oxygen depending on whether cooled or heated. One pair of compressors accepts oxygen while others releases it. Compressed oxygen liquefied when precooled and expanded.

B87-10355**MECHANISM CONNECTS AND DISCONNECTS LINES REMOTELY**

VICTOR STRAND (Rockwell International), and EARL V. HOLMAN (Rockwell International)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21086**Vol. 11, No. 7, P. 80**

Misaligned, widely separated connector halves joined, then separated when necessary, while human operator remains at distance. Remote-connection mechanism accommodates large displacements and misalignments of plug and receptacle.

B87-10356**HIGH-TEMPERATURE VIBRATION DAMPER**

ALAN CLARKE (United Technologies Corp.), JOEL LITWIN (United Technologies Corp.), and HAROLD KRAUSS (United Technologies Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11604**Vol. 11, No. 7, P. 81**

Device for damping vibrations functions at temperatures up to 400 degrees F. Dampens vibrational torque loads as high as 1,000 lb-in. but compact enough to be part of helicopter rotor hub. Rotary damper absorbs energy from vibrating rod, dissipating it in turbulent motion of viscous hydraulic fluid forced by moving vanes through small orifices.

B87-10357**ELECTROMAGNETIC REPULSIVE DEICER FOR AIRCRAFT**

LEONARD A. HASLIM, and ROBERT D. LEE

07 MACHINERY

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11613

Vol. 11, No. 7, P. 82

Scheme for removing ice from airfoils in flight adds little weight and demands relatively small amount of energy. Employing electromagnetic repulsion of conductors embedded in rubber covering on airfoil, scheme breaks up layer of ice by snapping it in manner of snapping rug to remove dust. Layer of elastomer conforms to shape of airfoil in relaxed state. When carrying large electrical currents, conductive ribbons in elastomer repel each other, creating ridged surface on airfoil. Sheet of ice on airfoil broken up in sudden transition from relaxed state to energized state.

B87-10358

SHAFT COUPLER WITH FRICTION AND SPLINE CLUTCHES

GLENN W. THEBERT (General Motors Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11627

Vol. 11, No. 7, P. 83

Coupling, developed for rotor of lift/cruise aircraft, employs two clutches for smooth transmission of power from gas-turbine engine to rotor. Prior to ascent, coupling applies friction-type transition clutch that accelerates rotor shaft to speeds matching those of engine shaft. Once shafts synchronized, spline coupling engaged and friction clutch released to provide positive mechanical drive.

B87-10359

FLEXIBLE COUPLING WITH CENTERING DEVICE

JAMES KERLEY

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-12976

Vol. 11, No. 7, P. 84

Misaligned machine shafts operating at low speeds coupled with cheap, simple mechanism made in part from wire rope. Wire rope bends to accommodate angular and lateral misalignments and dampens vibrations that accompany, or caused by, rotation of shafts.

B87-10360

COAL-FIRED ROCKET ENGINE

FLOYD A. ANDERSON (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16902

Vol. 11, No. 7, P. 84

Brief report describes concept for coal-burning hybrid rocket engine. Proposed engine carries larger payload, burns more cleanly, and safer to manufacture and handle than conventional solid-propellant rockets. Thrust changeable in flight, and stops and starts on demand.

B87-10361

LIGHTWEIGHT MONORAIL TRANSPORT SYSTEM

HAROLD F. WEIR (Rockwell International Corp.), KENNETH E. WOOD (Rockwell International Corp.), and MYRON T. STRECKER (Rockwell International Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21119

Vol. 11, No. 7, P. 85

Report proposes monorail transportation system for zero-gravity environment. System carries materials and parts between locations on space station. Includes tubular rails instead of open channels usually found in overhead conveyor systems. Since resistance to

torque of closed tube greater than that of open channel for same amount of material, tubular monorail designed for higher loads or for greater spacing between support points.

B87-10362

RECURSIVE ROBOT-ARM DYNAMICS VIA FILTERING AND SMOOTHING

GUILLERMO RODRIGUEZ (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17040

Vol. 11, No. 7, P. 85

Forward and inverse dynamics solved using Kalman filtering and Bryson-Frazier smoothing. Dynamics of serial-link robot arm solved by using recursive techniques from linear filtering and smoothing theory. Solutions of dynamical equations give forces, moments, and accelerations at joints between links, and multilink inertia matrix and its inverse. Theoretical developments lay foundation for use of filtering and smoothing techniques in design of robot controls.

B87-10417

CHARCOAL/NITROGEN ADSORPTION CRYOCOOLER

STEVEN BARD (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16786

Vol. 11, No. 8, P. 70

Refrigerator with no wear-related moving parts produces 0.5 W of cooling at 118 K. When fully developed, refrigerator needs no electrical power, and life expectancy of more than 10 yr, operates unattended to cool sensitive infrared detectors for long periods. Only moving parts in adsorption cryocooler are check valves. As charcoal is cooled in canister, gas pressure drops, allowing inlet check valve to open and admit more nitrogen. When canister is heated, pressure rises, closing inlet valve and eventually opening outlet valve.

B87-10418

LUMPED-PARAMETER REPRESENTATION OF WIND TUNNEL

SUSAN M. KROSEL, GARY L. COLE, WILLIAM R. BRUTON, and JOHN R. SZUCH

Sep. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-27036/NSP)

LEW-14515

Vol. 11, No. 8, P. 75

Mathematical model of proposed wind-tunnel facility represents wind-tunnel circuit and associated equipment in terms of lumped-parameter components. Requires less computational effort and computing time than full three-dimensional aerodynamic computer analysis of system with many volume elements. Approximates distributed nature of wind tunnel well enough to simulate steady-state and transient behavior for analysis of proposed control subsystems and for training of operators. Lumped-parameter circuit model represents wind tunnel and associated equipment. Implemented on analog or digital computers to simulate wind-tunnel performance without risk to operators or equipment.

B87-10419

SOLAR PUMP

CHARLES PIQUE (Martin Marietta Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28202

Vol. 11, No. 8, P. 76

Proposed pump moves liquid by action of bubbles formed by heat of sun. Tube of liquid having boiling point of 100 to 200 degrees F placed at focal axis of cylindrical reflector. Concentrated

sunlight boils liquid at focus, and bubbles of vapor rise in tube, carrying liquid along with them. Pressure difference in hot tube sufficient to produce flow in large loop. Used with conventional flat solar heating panel in completely solar-powered heat-storage system.

B87-10420**WIND-TUNNEL CAPABILITY AT AMES RESEARCH CENTER**

C. T. SNYDER, and L. L. PRESLEY

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11720

Vol. 11, No. 8, P. 76

Report describes \$700 million wind-tunnel complex at Ames Research Center, including auxiliary support systems, test instrumentation, and special test rigs. Planned near-term facility improvement aimed at providing new test capabilities and increased productivity, as well as some potential longer-term improvements, also discussed. Aerodynamic test facilities range from subsonic wind tunnels to highenthalpy arc jets.

B87-10421**PLASMA ROCKET WITH HYBRID EXHAUST PLUME**

FRANKLIN R. CHANG

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20476

Vol. 11, No. 8, P. 78

Proposed plasma rocket, described in report, generates hybrid exhaust plume comprising annular layer of relatively cool neutral gas around plasma core. Plasma and gas intermix, providing gradual radial transition between the two. Amount of gas injected adjusted to control propulsive efficiency; relatively cool gas boundary layer at surface of nozzle insulates nozzle from high plasma temperature.

B87-10422**ANALYSIS OF SOLAR ELECTRICAL AND THERMAL SYSTEMS**

M. KUDRET SELCUK (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16844

Vol. 11, No. 8, P. 78

Report describes computer program for parametric analysis of alternative ways of generating heat and electrical power on satellite or spacecraft. Program, Solar Space Power Analysis Code (SOSPAC), examines changes in area, weight, and cost of generator system for changing conditions, in particular for changes in ratio of thermal to electrical outputs. Outlines execution procedure and presents sample set of input data. Gives example of mass and area calculations for sample data for each type of generator system and illustrates results with variety of charts.

B87-10423**LINEARIZATION OF ROBOT MANIPULATORS**

KENNETH KREUTZ (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16911

Vol. 11, No. 8, P. 78

Four nonlinear control schemes equivalent. Report discusses theory of nonlinear feedback control of robot manipulator, emphasis on control schemes making manipulator input and output behave like decoupled linear system. Approach, called 'exact external linearization,' contributes efforts to control end-effector trajectories, positions, and orientations.

B87-10493**STEAM REFORMER WITH FIBROUS CATALYTIC COMBUSTOR**

GERALD E. VOECKS (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16971

Vol. 11, No. 9, P. 88

Proposed steam-reforming reactor derives heat from internal combustion on fibrous catalyst. Supplies of fuel and air to combustor controlled to meet demand for heat for steam-reforming reaction. Enables use of less expensive reactor-tube material by limiting temperature to value safe for material yet not so low as to reduce reactor efficiency.

B87-10494**HANGING WINDMILLS FROM CABLES**

MOSES G. FARMER

Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13434

Vol. 11, No. 9, P. 89

Relatively inexpensive structure enables raising and lowering of windmills. Windmills supported, according to new concept, by hanging from cables. Possible to raise and lower windmills easily for maintenance and to lower them to avoid excessive windspeeds. Airframe consists of fuselage and empennage. Windmill turns shaft driving electrical generator. Device aerodynamically stable so it will rotate in yaw to maintain windmill in downwind position as wind direction changes.

B87-10495**UNDUCTED-FAN ENGINE**

EDWARD T. MELEASON, and K. O. JOHNSON (General Electric Co.)

Oct. 1987 Additional information available through: AIAA, Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel: 212-247-6500) (A86-17829)

LEW-14429

Vol. 11, No. 9, P. 90

Unducted-fan (UDF Trademark) engine advanced counterrotating-pusher-propeller propulsion system for high-subsonic (mach 0.7 to 0.85) aircraft. Combines modern high-pressure-ratio gasturbine engine with multistage counterrotating power turbine directly coupled to counterrotating, advanced high-speed propellers. Key feature of system is unique direct turbine drive eliminating need for gearbox to transmit power to propeller blades.

B87-10496**FATIGUE LIVES OF MATERIALS CUT BY LASERS**

MICHAEL R. MARTIN (Mechanical Technology, Inc.)

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N87-11158/NSP)

LEW-14532

Vol. 11, No. 9, P. 90

Laser machining helps to balance high-speed rotating machinery. Report describes continuing studies of fatigue lives of materials cut by lasers. One long-term objective of such studies is use of laser machining to balance rotors operating at high speeds. To achieve objective, necessary to know relationship between effects of conventional and laser machining on fatigue lives of machined materials.

B87-10497**FLIGHT RESEARCH ON A FORWARD-SWEPT-WING AIRPLANE**

WALTER J. SEFIC, and CLEO M. MAXWELL

Oct. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-26328/NSP)

ARC-11740

Vol. 11, No. 9, P. 95

07 MACHINERY

Tests yield information relating to design, safety, and performance. Report gives overview of flight research program on X-29A experimental airplane. X-29A features forward-swept wings. Research program providing data needed to improve design, fabrications, and testing procedures for airplane.

B87-10548

COMPUTING AERODYNAMICS OF PROPFANS

B. CHANDRASEKARAN (Vigyan Research Associates, Inc.)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13623

Vol. 11, No. 10, P. 64

Cost and duration of wind-tunnel tests reduced. Computer program developed to predict interference of slipstream of propfan on supercritical wing at subsonic speeds. Use of program reduces cost and time involved in wind-tunnel testing of newly-designed wing/nacelle configurations. Program written in FORTRAN V.

B87-10549

SIMULATION OF THE INTERNAL-COMBUSTION ENGINE

FRANK J. ZELENK, and BONNIE J. MCBRIDE
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14313

Vol. 11, No. 10, P. 67

Program adapts to available information about particular engine. Mathematical model of internal-combustion engine constructed and implemented as computer program suitable for use on large digital computer systems. ZMOTTO program calculates Otto-cycle performance parameters as well as working-fluid compositions and properties throughout cycle for number of consecutive cycles and for variety of input parameters. Written in standard FORTRAN IV.

B87-10561

INFLATABLE PROBE WOULD MANIPULATE DELICATE PARTS

CARTER K. LORD (Olis Engineering)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26045

Vol. 11, No. 10, P. 88

Proposed inflatable probe grasp parts gently. Mechanism applies high contact pressures and less likely to damage delicate parts. Cylindrical bladder inflated against inner wall of surrounding hole in part to be grasped.

B87-10562

POWERED LIFT FOR PARAPLEGICS

BEN AUBERT
Nov. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11638

Vol. 11, No. 10, P. 88

Battery-operated lift designed to aid paraplegics in moving about locally. Raises or lowers paraplegic from or to bed, toilet, or wheelchair.

B87-10563

VARIABLE-RELUCTANCE MOTOR FOR ELECTRIC VEHICLES

JEFFREY H. LANG (Massachusetts Institute of Technology)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16993

Vol. 11, No. 10, P. 90

Report describes research on variable-reluctance electric-motor drive for eventual use in electric-vehicle propulsion. Primary design and performance criteria were torque and power output per unit

mass of motor, cost, and drive efficiency. For each criterion, optimized drive design developed, and designs unified to yield single electric-vehicle drive. Scaled-down motor performed as expected. Prototype of paraplegic lift operated by toggle switch and joystick. Lift plugs into household electrical outlet for recharging when not in use.

B88-10041

ANALYZING SOLAR-POWER OPTIONS FOR SPACECRAFT

M. K. SELCUK (Caltech)
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16855

Vol. 12, No. 1, P. 73

Solar Space Power Analysis Code, SOSAPAC, developed to examine solar-thermal and photovoltaic power-generation options available for satellite or spacecraft in low orbit around Earth. Is software tool for preliminary analysis of systems and enables engineer to compare areas, weights, and costs of several candidate electric- and thermal-power systems. Configurations studied include photovoltaic arrays and paraboloidal-dish systems to produce electricity only and in various combinations to provide both thermal and electric power. Written in FORTRAN IV.

B88-10042

COMPUTER PROGRAM PREDICTS TURBINE-STAGE PERFORMANCE

ROBERT J. BOYLE, JEFFREY E. HAAS, and THEODORE KATSANIS

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14218

Vol. 12, No. 1, P. 74

MTSBL updated version of flow-analysis programs MERIDL and TSONIC coupled to boundary-layer program BLAYER. Method uses quasi-three-dimensional, inviscid, stream-function flow analysis iteratively coupled to calculated losses so changes in losses result in changes in flow distribution. Manner effects both configuration on flow distribution and flow distribution on losses taken into account in prediction of performance of stage. Written in FORTRAN IV.

B88-10043

COMPUTER ANALYSIS OF HIGH-SPEED ROLLER BEARINGS

H. COE
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14512

Vol. 12, No. 1, P. 74

High-speed cylindrical roller-bearing analysis program (CYBEAN) developed to compute behavior of cylindrical rolling-element bearings at high speeds and with misaligned shafts. With program, accurate assessment of geometry-induced roller preload possible for variety of out-ring and housing configurations and loading conditions. Enables detailed examination of bearing performance and permits exploration of causes and consequences of bearing skew. Provides general capability for assessment of designs of bearings supporting main shafts of engines. Written in FORTRAN IV.

B88-10044

CALCULATING FLOWS IN MULTIPLE-BLADE-ELEMENT CASCADES

ERIC F. MCFARLAND
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14359

Vol. 12, No. 1, P. 76

Computer code written to analyze flows on blade-to-blade surfaces of turbomachinery. Analyzes rows containing blades of several different shapes and/or spacings. Capability makes code useful for calculating flows in centrifugal machinery with splitter blades or in mistuned blade rows, where blade spacing varies. Written primarily in FORTRAN IV.

B88-10059**ENGINE-MONITORING ALGORITHM**

WALTER C. MERRILL, and JOHN C. DELAAT

Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-24697/NSP)

LEW-14514**Vol. 12, No. 1, P. 87**

Allowances made for erroneous sensor readings. Algorithm developed to increase reliability of digital electronic control systems for aircraft turbine engines. Detects, isolates, and accommodates failures or errors in engine sensors. Generates engine-output estimates based on measurements of inputs and outputs and detects failures of input- and output-measuring sensors.

B88-10060**ADAPTIVE-WALL WIND TUNNEL**

DANIEL G. MORGAN, and GEORGE LEE

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11717**Vol. 12, No. 1, P. 88**

Side vents controlled automatically to compensate for interference by walls. Improved test station for 2- by 2-Foot Adaptive-Wall Wind Tunnel at Ames Research Center equipped for automatic sensing and correction of effects of walls on airflow in vicinity of test model. New facility well suited for advanced research and development. Velocities measured along lines near model used to calculate velocities observed along lines farther from model if model were in free air. Calculated values compared with velocities measured along farther lines.

B88-10061**VARIABLE-SPEED, CONSTANT-FREQUENCY GENERATION OF POWER**

FRANK J. BRADY

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14054**Vol. 12, No. 1, P. 88**

Feedback of stator power and reactive volt-amperes determines rotor excitation. New method involves control circuit separating rotor excitation into generation of slip frequency and control of amplitude and phase. In control circuit, speed determines slip frequency, while stator power and reactive volt-amperes determine amplitude and phase of rotor current.

B88-10062**DESIGNING A TRANSONIC NOZZLE FOR EFFICIENT COOLING**

WILLIAM R. WAGNER (Rockwell International Corp.)

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29224**Vol. 12, No. 1, P. 90**

Design for high-pressure transonic-flow nozzle increases effectiveness of coolant flowing in passages in wall nozzle. Revised curvatures of nozzle wall provide shortened transonic region and enable selection of approach- and discharge-wall angles for maximum cooling. Design enables wall to operate at lower temperature, reducing thermal fatigue and increasing life expectancy of wall. Also enables coolant to flow through wall channels with lower pressure drop and lower pumping pressure.

B88-10063**MINIMUM-TIME CONTROL FOR ROBOTIC MANIPULATORS**

JOHN T. WEN (Caltech)

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16919**Vol. 12, No. 1, P. 91**

Existence theorem proved for nonlinear systems. Report discusses mathematical requirements for existence of solution to minimum-time control problem for robotic manipulator that obeys nonlinear equations of motion.

B88-10114**COMPUTER CODE FOR TURBOCOMPOUNDED ADIABATIC DIESEL ENGINE**

D. N. ASSANIS (Massachusetts Institute of Technology), and J. B. HEYWOOD (Massachusetts Institute of Technology)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14403**Vol. 12, No. 2, P. 62**

Computer simulation developed to study advantages of increased exhaust enthalpy in adiabatic turbocompounded diesel engine. Subsystems of conceptual engine include compressor, reciprocator, turbocharger turbine, compounded turbine, ducting, and heat exchangers. Focus of simulation of total system is to define transfers of mass and energy, including release and transfer of heat and transfer of work in each subsystem, and relationship among subsystems. Written in FORTRAN IV.

B88-10124**ZERO-DEADBAND BALL BEARINGS**

MICHAEL J. HINE (Rockwell International Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29146**Vol. 12, No. 2, P. 74**

Proposed supports for ball bearings press outer races against balls without radial clearance. Diaphragm-like axially flexible springs eliminate deadband and consequent nonlinear radial vibrational response of rotor. If shaft needs two bearings at each end, they are supported independently or connected in series by U-spring. Mechanical stops limit axial travel of shaft.

B88-10125**EMERGENCY-EVACUATION CART**

OTTO H. FEDOR, and LESTER J. OWENS

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11282**Vol. 12, No. 2, P. 76**

Proposed cart designed to remove injured worker from vicinity of hazardous chemical spill. Self-propelled cart enables rescuer to move victim of industrial accident quickly away from toxic, flammable, explosive, corrosive, carcinogenic, asphyxiating, or extremely cold liquids. Intended for use where too dangerous for ambulances and other vehicles to approach accident site. Constructed of high-strength tubing, rides on bicycle wheels with balloon tires. Rescuer steers cart with handle at rear. Estimated mass of fully equipped vehicle is 650 lb.

B88-10126**GEAR HANDBOOK**

JOHN J. COY, DENNIS P. TOWNSEND, and ERWIN V. ZARETSKY

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-14612/NSP)

LEW-14489**Vol. 12, No. 2, P. 76**

Reference publication integrates results of 15 years of

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NASA-related gear research compiled to form complete design synthesis using latest analytical methods, materials, and lubrication analysis and techniques.

B88-10127

STUDY OF HELICOPTER-TAIL-ROTOR NOISE

ALI R. AHMADI (Newman, Inc.), and BOLT BERANEK (Newman, Inc.)

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-23376/NSP)

ARC-11677 Vol. 12, No. 2, P. 76

Report describes findings of experiment in generation of impulsive noise and fluctuating blade loads by helicopter tail rotor interacting with vortexes from main rotor. Experiment used model rotor and isolated vortex and designed to isolate blade/vortex interaction noise from other types of rotor noise.

B88-10128

INTERFERENCE FITS AND ROLLER-BEARING FATIGUE

HAROLD H. COE, and ERWIN V. ZARETSKY

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-19616/NSP)

LEW-14490 Vol. 12, No. 2, P. 77

Technical memorandum describes studies of effects of interference fits on fatigue lives of roller bearings. Factors affecting life and stress analyzed.

B88-10129

TESTING PARABOLIC-DISH CONCENTRATORS

M. KUDRET SELCUK (Caltech)

Feb. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N85-28447/NSP)

NPO-16848 Vol. 12, No. 2, P. 78

Report describes test equipment and tests at Parabolic Dish Test Site at Edwards Air Force Base in California. Site established in 1978 for testing point-focusing solar concentrators operating at temperatures above 600 degree F. Used for six years to evaluate parabolic-dish concentrators, receivers, power-conversion units, and solar/fossil-fuel hybrid units. Report describes evolution of test program at site, lists experiments conducted there in chronological order, and summarizes experimental data.

B88-10130

TRANSFER LUBRICATION FOR CRYOGENIC BEARINGS

S. A. BARBER (Battelle Memorial Institute), J. W. KANNEL (Battelle Memorial Institute), and K. F. DUFRANE (Battelle Memorial Institute)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27167 Vol. 12, No. 2, P. 78

Report presents evaluation of bronze-filled polytetrafluoroethylene (PTFE), known as Salox M, as cage material for ball bearings in high-pressure turbopumps for liquid oxygen. Material evaluated as potentially longer-lived replacement for glass-filled PTFE, known as Armalon. Cage transfers PTFE to balls to form solid lubricant film. However, glass fibers in glass-filled material tend to interfere with transfer. Two cage-design concepts developed; one involves metal-reinforced cage of bronze-filled PTFE; other calls for bronze-filled PTFE inserts in metal structure.

B88-10131

FLEXIBLE DOCKING TUNNEL

ROGER MICHAUD (General Electric Co.), LADONNA MILLER (General Electric Co.), and KATHY ALBRIGHT (General Electric Co.)

Feb. 1988 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21226 Vol. 12, No. 2, P. 79

Brief report proposes use of flexible tunnel to provide 'soft docking' between Space Shuttle Orbiter and space station during resupply visits. Soft docking reduces risks of structural damage to either spacecraft during docking maneuvers, provides adaptable docking interface, and avoids jarring sensitive material-processing experiments in space station. After docking, tunnel pressurized to enable exchange of people and cargo between two spacecraft.

B88-10132

RECURSIVE DYNAMIC EQUATIONS FOR TWO ROBOT ARMS IN A CLOSED CHAIN

GUILLERMO RODRIGUEZ (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17072 Vol. 12, No. 2, P. 79

Paper discusses use of difference equations from Kalman filtering and Bryson-Frazier smoothing to solve equations of forward dynamics of closed chain of robot-arm links. 'Forward dynamics' is computation of linear and angular accelerations of joints between links, given set of applied or prescribed joint torques. Paper lays foundation for potential use of filtering and smoothing techniques in dynamics of robots and in design of controls for robots.

B88-10193

COMPUTER-AIDED DESIGN OF TURBINE BLADES AND VANES

WAYNE Q. HSU (Rockwell International Corp.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29265 Vol. 12, No. 3, P. 64

Quasi-three-dimensional method for determining aerothermodynamic configuration of turbine uses computer-interactive analysis and design and computer-interactive graphics. Design procedure executed rapidly so designer easily repeats it to arrive at best performance, size, structural integrity, and engine life. Sequence of events in aerothermodynamic analysis and design starts with engine-balance equations and ends with boundary-layer analysis and viscous-flow calculations. Analysis-and-design procedure interactive and iterative throughout.

B88-10194

PORTABLE HORIZONTAL-DRILLING AND POSITIONING DEVICE

EDMUND SMIGOCKI, and CLARENCE JOHNSON

Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13031 Vol. 12, No. 3, P. 65

Portable horizontal-drilling and positioning device, constructed mainly of off-the-shelf components, accurately drills horizontal small holes in irregularly shaped objects. Holes precisely placed and drilled in objects that cannot be moved to shop area. New device provides three axes of movement while maintaining horizontal drilling.

B88-10195

SYSTEMS ANALYSIS OF ADVANCED COAL-BASED POWER PLANTS

JOSEPH F. FERRALL (Caltech), CHARLES N. JENNINGS (Caltech), and ALFRED W. PAPPANO (Caltech)

Mar. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

NPO-16842 Vol. 12, No. 3, P. 66

Report presents appraisal of integrated coal-gasification/fuel-cell power plants. Based on study comparing fuel-cell technologies with each other and with coal-based alternatives and recommends most promising ones for research and development. Evaluates capital cost, cost of electricity, fuel consumption, and conformance with environmental standards. Analyzes sensitivity of cost of electricity to changes in fuel cost, to economic assumptions, and to level of technology. Recommends further evaluation of integrated coal-gasification/fuel-cell integrated coal-gasification/combined-cycle, and pulverized-coal-fired plants. Concludes with appendixes detailing plant-performance models, subsystem-performance parameters, performance goals, cost bases, plant-cost data sheets, and plant sensitivity to fuel-cell performance.

B88-10255**DOVETAIL ROTOR CONSTRUCTION FOR PERMANENT-MAGNET MOTORS**

LAWRENCE J. KINTZ, JR. (Sundstrand Corp.), and WILLIAM J. PUSKAS (Sundstrand Corp.)

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-20942**Vol. 12, No. 4, P. 62**

New way of mounting magnets in permanent-magnet, electronically commutated, brushless dc motors. Magnets wedge shaped, tapering toward center of rotor. Oppositely tapered pole pieces, electron-beam welded to rotor hub, retain magnets against centrifugal force generated by spinning rotor. To avoid excessively long electron-beam welds, pole pieces assembled in segments rather than single long bars.

B88-10256**CALCULATING TURBINE-BLADE LOADS**

SEN YIH MENG (Rockwell International Corp.), EUGENE D. JACKSON, III (Rockwell International Corp.), and RAYMOND B. FURST (Rockwell International Corp.)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29165**Vol. 12, No. 4, P. 63**

Rotor/stator interactions analyzed with help of approximations. Analytical procedure assists designers of turbomachinery in calculating dynamic loads on blades and vanes. Procedure involves approximations simplifying calculation of phase angles and amplitudes of pressure fields throughout blade and vane rows at each disturbance frequency.

B88-10257**HIGH-CAPACITY, PORTABLE FIREFIGHTING PUMP**

RALPH A. BURNS

Apr. 1988 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

MFS-27177**Vol. 12, No. 4, P. 65**

Report describes an evaluation of firefighting module that delivers water at 5,000 gal/min (320 L/s). Is compact, self-contained, portable water pump. Besides firefighting, module used for flood control, pumping water into large vessels, and pump water from sinking ships.

B88-10307**TEST APPARATUS FOR OVERSIZE BALL-BEARING MODELS**

WILLIAM R. WAGNER (Rockwell International Corp.)

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29284**Vol. 12, No. 5, P. 73**

See-through machine enables direct observation and indirect measurements at moderate speeds. Model of ball bearing, six

times larger than real bearing, rotated in test machine. Transparency of walls and simulated lubricant reveal flow patterns and allow visible-light and infrared photographs to be made.

B88-10308**HANDHELD CONTROLLER FOR ROBOTIC END EFFECTOR**

BRUNO M. JAU (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16732**Vol. 12, No. 5, P. 73**

Controller provides both position and force feedback. Hand grip houses controller. End-effector force and position fed back to operator's hand through rotation of trigger and rocking of trigger guard.

B88-10309**ROBOTIC TOOL-EXCHANGE SYSTEM**

MARION A. WISE, and BARRY S. LAZOS

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13558**Vol. 12, No. 5, P. 74**

System uses conventional power source to exchange tools. Tool rack supported by spring-loaded base allowing sufficient motion of tool rack to reduce requirement of positioning accuracy of end effector.

B88-10310**SIMULATING UNPOWERED HELICOPTER LANDINGS**

WILLIAM A. DECKER, CHARLES F. ADAM, and RONALD M. GERDES

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11715**Vol. 12, No. 5, P. 75**

Report presents results of experiment with visual, aural, and motion cues in simulations of helicopter landings without engine power. Helicopter simulators do not offer realistic environment, particularly in sensory cues for near-ground, low-speed flight. Evaluated importance of various cues in difficult autorotation. Conducted in vertical-motion simulator with experienced pilots as subjects.

B88-10311**COMPUTING THE COMPLIANCES OF GEAR MESHES**

D. G. LEWICKI, M. SAVAGE (University of Akron), R. J. CALDWELL (University of Akron), and G. D. WISOR (University of Akron)

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18092)

LEW-14554**Vol. 12, No. 5, P. 75**

Computer model simulates compliance and sharing of loads in spur-gear mesh. Use of solid-body analysis as lower bound and rim analysis as upper bound for mesh compliance, reasonable approximations obtained for compliance in spur-gear mesh.

B88-10352**QUASI-THREE-DIMENSIONAL ANALYSIS OF TURBINE FLOW**

WAYNE W. HSU (Rockwell International Corp.)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29280**Vol. 12, No. 6, P. 76**

Computer program reduces computer time and treats multiple elements. Improved design-analysis program for turbomachinery applied to multiple turbine elements simultaneously. Enables continuous and coherent analyses rather than previous piece-meal

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analyses of flow fields. Effects of upstream elements on downstream flow taken into account automatically.

B88-10353

DESIGNING FILM-COOLED TURBINE DISKS

WILLIAM R. WAGNER (Rockwell International Corp.)

Jun. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29287

Vol. 12, No. 6, P. 76

Technique optimizes weight and speeds of disks in film-cooled turbines. Proposed iterative approach to design enables shaping of turbine disks partly according to temperature profiles. Suitable for design of advanced stationary, aircraft, and rocket turbines.

B88-10387

CODING ROPES FOR LENGTH AND SPEED MEASUREMENTS

CHARLES C. RUPP, and GEORG VON TIESENHAUSEN

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28226

Vol. 12, No. 7, P. 66

Ferromagnetic staples serve as markers. Like crude magnetic-tape-playback head, sensor detects ferromagnetic staples as rope is unwound or wound. Pulses from staples analyzed electronically; numbers of pulses and intervals between them interpreted in terms of velocity of rope and length payed out. Adaptable to laying submarine cables and construction of suspension bridges.

B88-10388

PREDICTING TEMPERATURES IN BALL BEARINGS

WILLIAM R. WAGNER (Rockwell International Corp.), and BRAD R. HEMMINGS (Rockwell International Corp.)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29285

Vol. 12, No. 7, P. 66

Computer simulations speed design studies. Analyses performed in two or three dimensions. Sizes and shapes of components approximated by zones or nodes connected by gridlines. From geometric information about grids and boundary conditions, properties of bearing and lubricant materials, and information supplied by users, thermal-analysis programs generate mathematical models for thermal transport. Thermal analysis of high-speed rolling contact bearings matured so much that computerized numerical simulations replace expensive time consuming full scale experiments.

B88-10389

SPARK IGNITERS FIT IN CORRECT LOCATIONS ONLY

FRED J. WENDLAND (Rockwell International Corp.)

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29370

Vol. 12, No. 7, P. 72

Pins create interference if incorrect assembly is attempted. When two different types of spark igniters must be used on same engine simple expedient ensures that each igniter is inserted in correct hole. Damage to engine and consequent failure are thereby avoided. Pins in base of spark igniter allow part to be inserted in any type hole.

B88-10390

CONTINUOUS-FLOW CENTRIFUGAL SEPARATOR

ROBERT D. WALDRON (Rockwell International Corp.)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21173

Vol. 12, No. 7, P. 74

Apparatus combines principles of centrifugal and cyclone separators to control movement of solid or liquid particles suspended in flowing gas. Spinning disk contains radial channels, width varies as function of distance from center. Gas flows from outer ring around disk toward center. Particles in gas collected at periphery, center or both.

B88-10391

LARGE-ANGLE MAGNETIC SUSPENSION (LAMS)

RONALD E. OGLEVIE (Rockwell International Corp.), DAVID B. EISENHAURE (Draper (Charles Stark) Lab., Inc.), and JAMES R. DOWNER (Draper (Charles Stark) Lab., Inc.)

Jul. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-15338)

LAR-13587

Vol. 12, No. 7, P. 74

Spherical LAMS is magnetic suspension that provides dual functions of magnetic bearing and rotorgimbal system. Provides two degrees of angular freedom within single magnetic suspension system. Approach employs spherically-shaped magnetic-gap surfaces to achieve much-larger angular freedom than available from previous suspensions.

B88-10392

NONLINEAR ANALYSIS OF ROTOR DYNAMICS

WILLIAM B. DAY (Auburn University), and RICHARD ZALIK (Auburn University)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26051

Vol. 12, No. 7, P. 75

Study explores analytical consequences of nonlinear Jeffcott equations of rotor dynamics. Section 1: Summary of previous studies. Section 2: Jeffcott Equations. Section 3: Proves two theorems that provide inequalities on coefficients of differential equations and magnitude of forcing function in absence of side force. Section 4: Numerical investigation of multiple-forcing-function problem by introducing both side force and mass imbalance. Section 5: Examples of numerical solutions of complex generalized Jeffcott equation with two forcing functions of different frequencies f_1 and f_2 . Section 6: Boundedness and stability of solutions. Section 7: Concludes report reviewing analytical results and significance.

B88-10431

RIM-SUPPORTED TURBINE SEAL

KENT O. LONGENECKER (United Technologies Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28112

Vol. 12, No. 8, P. 74

Interstage seal accommodates large pressure drop across vane stage. Sealing surfaces close to inner diameter of gas-flow path. Two blade stages supported by single disk, broached over entire width of rim. Seal concept developed for small rocket turbines as liquid-oxygen pumps. Well suited to turbines with high pressure drops across vane stages.

B88-10432

SELF-CENTERING RECIPROCATING-PERMANENT-MAGNET MACHINE

SURESH BHATE (Mechanical Technology, Inc.), and NICK VITALE (Mechanical Technology, Inc.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14263

Vol. 12, No. 8, P. 74

New design for monocoil reciprocating-permanent-magnet electric machine provides self-centering force. Linear permanent-magnet electrical motor includes outer stator, inner stator, and permanent-magnet plunger oscillating axially between extreme left and right positions. Magnets arranged to produce

centering force and allows use of only one coil of arbitrary axial length. Axial length of coil chosen to provide required efficiency and power output.

B88-10433

YAW CONTROL AT HIGH ANGLES OF ATTACK

DANIEL G. MURRI, and DHANVADA M. RAO (Vigyan Research Associates, Inc.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13472

Vol. 12, No. 8, P. 76

Hinged, conformal forebody strakes provide control when rudders become ineffective. Device consists of symmetric pair of longitudinally hinged strakes designed to fold completely into forebody contour. Strakes rotate individually out into external flow. Asymmetric flow produced by deployed strake generates sideward force causing aircraft to yaw.

B88-10434

GRAVITY COMPENSATION TECHNIQUE USES SMALL DC MOTOR

RICHARD HOLLOW

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11525

Vol. 12, No. 8, P. 78

Small dc servomotor powered by simple constant-current source and with suitable gearing used to cancel effect of gravity upon load. Lead-screw positioning system has load counterbalanced by small supplementary motor powered by constant current source. Motor lighter and more compact alternative to counterbalance. Used in variety of mechanical systems where load positioned or accelerated in vertical plane.

B88-10435

IMPROVED ROBOT-JOINT CALCULATIONS

L. KEITH BARKER

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-27953)

LAR-13682

Vol. 12, No. 8, P. 79

Modified Denavit-Hartenberg parameters better for locating successive joint-axis systems. Modification results from insistence that transverse vector between successive joint rotational axes be perpendicular to one of rotational axes instead of both axes. Useful in industrial calibration of robot arms.

B88-10436

PREDICTING LIFE AND RELIABILITY OF A ROTATING DISK

ERWIN V. ZARETSKY, TODD E. SMITH (Sverdrup Technology, Inc.), and RICHARD AUGUST (Sverdrup Technology, Inc.)

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-13755)

LEW-14582

Vol. 12, No. 8, P. 80

Report of generalized method for prediction of fatigue life and reliability of rotating disk. Method incorporates computation of life, at given probability of survival, of elemental stressed volumes within body of disk. Effects of design variables, temperature gradients, and speeds examined. Useful in analysis, design, and development of disks for aircraft-engine turbines and compressors and flywheels for industrial and automotive applications.

B88-10437

CEPSTRAL ANALYSIS DETECTS BALL-CAGE WEAR

GARY E. WEESE (Rockwell International Corp.), and MICHAEL G. HINE (Rockwell International Corp.)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

MFS-29187

Vol. 12, No. 8, P. 80

Report discusses application of cepstral analysis to diagnosis of wear in ball-bearing cages in rotating machinery. Ball-cage vibrations and changes in vibrations symptomatic of wear is detected earlier in test than by more conventional methods based on strain-gauge measurements. Particularly useful in diagnoses of gearboxes and rolling-element bearing.

B88-10438

SOLID ROCKET WITH INTEGRAL CASE

CARLETON J. MOORE

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28263

Vol. 12, No. 8, P. 81

Report describes proposed solid-propellant rocket motor. Case of motor integrated with propellant and burns and produces thrust as propellant combustion proceeds outward. Propellant and case manufactured together. Proposed motor increases payload-weight capacity.

B88-10439

ROTARY JOINT FOR THE SPACE STATION

STUART H. LOEWENTHAL, and FREDRICK T. SCHULLER

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-30206)

LEW-14542

Vol. 12, No. 8, P. 82

Most critical mechanism aboard station is rotary joint performing tracking function. Study conducted to determine optimum mechanism for rotary joint. Best mechanism is continuously rotating joint base on concept of multiple, discrete bearing-supported joint driven by self-loading, 'pinch'-roller drive actuator. Applicable to solar-power-conversion units and earthbound solar-power farms and other related power-generation systems.

B88-10440

SEALS FOR CRYOGENIC TURBOMACHINES

ROBERT C. HENDRICKS, L. T. TAM (CHAM), M. J. BRAUN (University of Akron), and B. L. VLCEK (Rensselaer Polytechnic Institute)

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-15442)

LEW-14556

Vol. 12, No. 8, P. 82

Analysis considers effects of seals on stability. Report presents method of calculation of flows of cryogenic fluids through shaft seals. Key to stability is local average velocity in seal. Local average velocity strongly influenced by effects of inlet and outlet and injection of fluid.

B88-10497

MANIPULATOR FOR A VACUUM CHAMBER

F. HUNSAKER, and K. OGILVIE

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13130

Vol. 12, No. 9, P. 82

Rotary seal provides for external actuators. Positioner in vacuum employs four actuators; up/down, horizontal rotary, horizontal, and vertical rotary. External up/down and azimuthal actuators drives shaft entering vacuum chamber through sliding and rotating seal. Placement of actuator motors outside vacuum chamber reduces heat-removal load on system. Atop 2.5-cm-diameter shaft is stage supporting masses as great as 15 kg. Small motors on stage provide horizontal translation and rotation in vertical plane. Manipulator developed for calibrating plasma detectors by subjecting them to particle beams in vacuum. Standard, commercially available parts used.

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B88-10498

AIR-OPERATED SUMP PUMP

GARY D. NOLT

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11414

Vol. 12, No. 9, P. 82

Pump removes liquid seepage from small, restricted area and against large pressure head. Developed for moving small amounts of water and oil from sump pit 85 ft (25.91 m) deep. Fits in space only 6 1/2 in. (16.5 cm) in diameter and 18 in. (45.7 cm) long. In discharge part of pumping cycle, air forces liquid out of pump chamber through pipe. During filling part of pumping cycle, water enters pump chamber from sump pit. Float in chamber next to pump chamber controls pressurization through timer and solenoid valve.

B88-10499

DEVICE ROTATES BEARING BALLS FOR INSPECTION

R. K. BURLEY (Rockwell International Corp.)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-19717

Vol. 12, No. 9, P. 86

Entire surface of ball inspected automatically and quickly. Device holds and rotates bearing ball for inspection by optical or mechanical surface-quality probe, eddy-current probe for detection of surface or subsurface defects, or circumference-measuring tool. Ensures entire surface of ball moves past inspection head quickly. New device saves time and increases reliability of inspections of spherical surfaces. Simple to operate and provides quick and easy access for loading and unloading of balls during inspection.

B88-10500

ANGULAR-MOMENTUM-COMPENSATING ACTUATOR

PETER J. WIKTOR (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16928

Vol. 12, No. 9, P. 86

Reactionless actuator developed for instrument-pointing platforms on flexible spacecraft; by eliminating reactions, actuator changes aiming angle of platform without inducing vibrations in spacecraft, eliminating vibrations in point angle of instrument platform. Actuator used on Earth in such systems as helicopter platforms for television cameras in law enforcement and news telecasts.

B88-10501

STACKED-DISK COMBUSTOR

WALTER B. INGLE (Rockwell International Corp.)

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29333

Vol. 12, No. 9, P. 87

Materials chosen for strength rather than thermal conductivity. Stacked washerlike disks accommodate built-in coolant passages while providing combustion zone of ideal shape. Fuel flows through coolant passages where preheated before entering combustion zone through passages in disks. Eight coolant passages in cross section, although number in particular application determined by required rate of flow of fuel and pressure drop. Combustion chamber operates for greater efficiency at pressures and temperatures higher than those of conventional tube-wall combustion chamber.

B88-10542

CONVERTIBLE GAS-TURBINE ENGINES

K. L. ABDALLA, J. G. MCARDLE, and H. LINDSAY (General Electric Co.)

Nov. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-16825)

LEW-14597

Vol. 12, No. 10, P. 68

Convertible engine aircraft gas-turbine is two engines in one. Produces turbofan thrust, turboshaft power, or any combined thrust and shaftpower continuously while operating up to full speed. Used to power vertical/short-takeoff-and-landing (V/STOL) airplanes and advanced high-speed rotorcraft. Rotorcraft shows use of convertible engines rather than separate engines for rotor power and forward thrust affords advantages in installation and save 16 percent in fuel and 20 percent in direct operating costs. Engine used for propulsion of new high-speed rotorcraft that needs both thrust and shaft power. Also used to cross-couple fans of two-engine V/STOL aircraft.

B88-10543

ANGULAR-MOMENTUM-COMPENSATING SERVOMECHANISM

CARL A. MARCHETTO (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17173

Vol. 12, No. 10, P. 69

Servomechanism for rotating an instrumentation platform isolates supporting vehicle or stationary platform from reaction torques produced by rotations. Prevents aiming of instrument from disturbing vehicle or other instrument platforms. Rotating oppositely to instrument platform, reaction wheel, motor, and gear 1 have angular momentum equal and opposite to gear 2, output shaft, and platform. External torque reaction to rotation of platform canceled. Although spur gears appear in schematic diagram, gear train made of spline gears.

B88-10544

AUTOMATED WATER-PURIFICATION SYSTEM

HARLOW G. AHLSTROM (Caltech), PETER S. HAMES (Caltech), and FREDRICK J. MENNINGER (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17049

Vol. 12, No. 10, P. 70

Reverse-osmosis system operates and maintains itself with minimal human attention, using programmable controller. In purifier, membranes surround hollow cores through which clean product water flows out of reverse-osmosis unit. No chemical reactions or phase changes involved. Reject water, in which dissolved solids concentrated, emerges from outer membrane material on same side water entered. Flow controls maintain ratio of 50 percent product water and 50 percent reject water. Membranes expected to last from 3 to 15 years.

B88-10545

COMPUTERIZED ANALYSIS OF HELICOPTER-ROTOR AEROELASTICITY

T. S. R. REDDY

Nov. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-24455)

ARC-11809

Vol. 12, No. 10, P. 71

Analysis of aeroelastic stability of helicopter rotor automated. Symbolic-manipulation program, HESL, written in FORTRAN, used to aid in derivation of government equations of motion for elastic-bladed rotor. Operates both on expressions and matrices. By transferring some burden of algebraic manipulations from human analyst to computer, program reduces tedious analysis and consequent opportunity for errors.

B88-10600

GENERAL-AVIATION CONTROL LOADER

DANIEL W. BALTRUS (Sperry Corp.), LEROY F. ALBANG (Sperry

Corp.), JOHN A. HALLINGER (Sperry Corp.), and W. WAYNE BURGE (Sperry Corp.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13707

Vol. 12, No. 11, P. 74

Artificial-feel system designed for general-aviation flight simulators. New system developed to replace directly lateral and longitudinal controls in general-aviation cockpit for use in flight-simulation research. Using peaucellier's cell to convert linear motion to rotary motion, control-loading system provides realistic control-force feedback to cockpit wheel and column controls.

B88-10601

PORTABLE LIQUID-INJECTING SYSTEM

T. SHUCK (Rockwell International Corp.), F. CHIN (Rockwell International Corp.), and M. HANSEN (Rockwell International Corp.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21308

Vol. 12, No. 11, P. 74

Portable injecting-gun system dispenses predetermined amount of liquid at moderately high pressure. Tool belt holds components of liquid-injecting system. Pump and four-way valve combined in nylon housing. Connected to injecting nozzle and other components by polyvinyl tubing.

B88-10602

SEAL FOR PRECOOLING A TURBOPUMP

SAMUEL S. OWEN (United Technologies Corp.), and R.C. MULREADY (United Technologies Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28270

Vol. 12, No. 11, P. 75

Diaphragm reduces misalignment. Rotary seal retains precooling fluid in pump section of cryogenic turbopump, preventing fluid from entering turbine section. Precooling fluid held in pump section of turbopump by knife-edge labyrinth seal on diaphragm.

B88-10603

DETECTING WEAR IN BALL BEARINGS DURING OPERATION

MICHAEL J. HINE (Rockwell International Corp.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29376

Vol. 12, No. 11, P. 76

Strain-gauge signals at harmonics of ball-bearing-cage frequencies signify wear. Brief report describes experiments in continuing effort to interpret vibrations of machinery in terms of wear in ball bearing.

B89-10029

GENERATION METHOD IMPROVES SPIRAL BEVEL GEARS

FAYDOR L. LITVIN (University of Illinois at Chicago), WEI-JIUNG TSUNG (University of Illinois at Chicago), JOHN J. COY (Army Aviation Research and Development Command), and CHARLES HEINE (Dana Corp.)

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-25793)

LEW-14611

Vol. 13, No. 1, P. 49

Conjugate tooth surfaces reduce kinematic errors. Method for generation of spiral bevel gears provides conjugated gear-tooth surfaces and improved bearing contact. Conjugated surfaces preferable because maintain constant gear ratios during tooth-contact cycles. Changing gear ratios of nonconjugated surfaces give rise to kinematic errors in transfer of motion from driving gears to driven gears. Errors major sources of noise in

power transmissions. Computer program developed to simulate cutting and meshing processes for pinions and gears to minimize kinematical errors.

B89-10030

NEW METHODS FOR GENERATING GEAR SURFACES

JOHN J. COY, ROBERT F. HANDSCHUH, F. L. LITVIN (University of Illinois at Chicago), W.-J. TSUNG (University of Illinois at Chicago), and C.-B. P. TSAY

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-15466)

LEW-14570

Vol. 13, No. 1, P. 50

Report presents new methods for generating spur, helical, and spiral-bevel gears. Computer programs for analysis of tooth contacts developed for gears. Applied to spiral-bevel gears by use of currently available machinery and tools.

B89-10031

FREE-PISTON STIRLING ENGINES

RICHARD K. SHALTENS

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-15031)

LEW-14558

Vol. 13, No. 1, P. 50

Engines promise cost-effective solar-power generation. Report describes two concepts for Stirling-engine systems for conversion of solar heat to electrical energy. Recognized most promising technologies for meeting U.S. Department of Energy goals for performance and cost for terrestrial electrical-energy sources.

B89-10032

PILOTED SIMULATIONS OF A V/STOL AIRCRAFT

MEGAN A. ESKEY, and SAMUEL B. WILSON, III

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-12558)

ARC-11807

Vol. 13, No. 1, P. 77

Flight and control characteristics evaluated. Report describes simulated flight tests to evaluate handling qualities and flight characteristics of Grumman Design 698 aircraft, vertical and short takeoff and landing (V/STOL) aircraft.

B89-10033

ASSESSMENT OF SEMI-EMPIRICAL DYNAMIC STALL MODELS FOR TURBOPROP STALL CALCULATIONS

K. R. V. KAZA, and T. S. R. REDDY (University of Toledo)

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18883)

LEW-14657

Vol. 13, No. 1, P. 77

Report presents comparison of stall-flutter responses obtained from three semiempirical dynamic stall models. Part of effort to develop models for stall-flutter analysis of highly loaded propellers (advanced turboprops). Available models of dynamic stall applied to simple structural models to study extent of validity and select appropriate model for application to advanced turboprops. Conclusion during study is operating environment of advanced turboprop favors conditions of light stall, in which loads induced by vortices not severe.

B89-10087

FIBER-OPTIC SENSOR WOULD DETECT MOVEMENTS OF SHAFT

EDMUND J. ROSCHAK (Rockwell International Corp.)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29382

Vol. 13, No. 2, P. 80

Fiber-optic sensor senses both rotational speed and axial displacement of shaft in motor, pump, or other rotating machine. Does not require magnetic materials, notches, or grooves in shaft.

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Required modification of shaft is etching or plating surface to make ring black around half circumference and reflective around other half along short length at one end or some other convenient location. Triangular bundle of sending and receiving optical fibers aimed at black/reflective ring on shaft. Frequency and amplitude of output pulses of fiber-optic probe indicates rotational frequency and axial position of shaft.

B89-10088

TETHERED REMOTE MANIPULATOR

THOMAS C. BRYAN

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28305

Vol. 13, No. 2, P. 81

Remote-manipulator concept for retrieval or inspection of objects in outer space applied to underwater or in tanks of hazardous chemicals. System includes tether head on outer end of tether cable wound on motor-driven takeup reel. Head includes mounting plate with four canted thrusters facing rearward, solid-state camera with patterned sources of light facing forward, and pneumatic inflatable end effector. Also includes device to cut head loose in emergency. Intended for use in places beyond reach of jointed rigid-arm manipulator and where unsafe or impractical to send humans.

B89-10089

TWO-THUMBED ROBOT HAND

SUKHAN LEE (University of Southern California)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17274

Vol. 13, No. 2, P. 82

Robot hand includes thumblike members on left and right sides and fingerlike member at middle. Configuration of digits enables hand to adapt to variously shaped objects, grasp them robustly and reliably, and manipulate them. Reduces complexity of control mechanisms and provides kinesthetic perception of shapes of grasped objects. Mechanical hand with two thumbs and middle finger made from commercially available components. With specially designed dc motors and assemblies of gears, size of hand reduced considerably. Suited to handling objects in industrial tasks.

B89-10090

INJECTED WATER AUGMENTS COOLING IN TURBOSHAFT ENGINE

THOMAS J. BIESIADNY, BRETT BERGER (Army Aviation Research and Technology Activity), GARY A. KLANN (Army Aviation Research and Technology Activity), and DAVID A. CLARK (Army Aviation Research and Technology Activity)

Feb. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20280)

LEW-14706

Vol. 13, No. 2, P. 85

Report describes experiments in which water injected into compressor-bleed cooling air of aircraft turboshaft engine. Injection of water previously suggested as way to provide additional cooling needed to sustain operation at power levels higher than usual. Involves turbine-inlet temperatures high enough to shorten lives of first-stage high-pressure turbine blades. Latent heat of vaporization of injected water serves as additional heat sink to maintain blades at design operating temperatures during high-power operation.

B89-10141

MULTIHUNDRED-KILOWATT ROTARY ELECTRICAL-TRANSFER DEVICE

PETER JACOBSON (Sperry Flight Systems)

Mar. 1989 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14269

Vol. 13, No. 3, P. 78

Roll-ring electrical-power-transfer device capable of transferring high power (hundreds of kilowatts) through rotating connection. Roll-ring assembly transfers up to 500 V at 200 A per circuit, either dc or ac to frequencies of 20 kHz. Assembly has eight power circuits. Outstanding feature of design very low power loss - only 16 W per circuit while transferring 100 kW. Terrestrial application requiring power to transfer through rotating joint with low losses uses roll-ring technology. Used in air or vacuum with no design changes.

B89-10142

MINIATURE CENTRIFUGAL COMPRESSOR

HERBERT SIXSMITH (Creare, Inc.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13093

Vol. 13, No. 3, P. 78

Miniature turbocompressor designed for reliability and long life. Cryogenic system includes compressor, turboexpander, and heat exchanger provides 5 W of refrigeration at 70 K from 150 W input power. Design speed of machine 510,000 rpm. Compressor has gas-lubricated journal bearings and magnetic thrust bearing. When compressor runs no bearing contact and no wear.

B89-10143

CORRELATION ANALYSIS OF VIBRATION DATA FROM ROTARY PUMPS

JAMES R. FENWICK (Rockwell International Corp.)

Mar. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29401

Vol. 13, No. 3, P. 79

Correlation technique represents vibration data from rotary pumps in compact form convenient for storage in data base. Analysis determines coefficients of Fourier series representing typical response of pump for one revolution of pump shaft. Changes in harmonic spectrum of pump indicates changes in performance caused by internal wear, rubbing of seals, and the like.

B89-10144

SELF-ALIGNING ROBOTIC END EFFECTOR AND RECEPTACLE

GLEN J. VANSANT (RCA Corp.), and EUGENE G. GIBBS (RCA Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13152

Vol. 13, No. 3, P. 80

Industrial-robot hand (end effector) and mating receptacle include congruent male and female conical and V-shaped surfaces for positive alignment. Surfaces of end effector and receptacle keyed to each other for automatic alignment. Lifting pins inserted in receptacle to lock end effector and receptacle together. Tool turns mounting screw, and end effector lifts object.

B89-10196

REDUCING THRUSTS IN SOLID-FUEL ROCKETS

LAURENCE J. BEMENT

Apr. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13744

Vol. 13, No. 4, P. 101

Thrust-terminating system conceived to reduce thrust of solid-propellant rocket motor in controlled manner such that thrust loads not increased or decreased beyond predictable levels. Concept involves explosively cutting opposing venting pairs in case of rocket motor above nozzles to initiate venting of chamber and

reduction of thrust. Vents sized and numbered to control amount and rate of reduction in thrust.

B89-10197

DYNAMIC, HIGH-TEMPERATURE, FLEXIBLE SEAL

BRUCE M. STEINETZ, and PAUL J. SIROCKY (Sverdrup Technology, Inc.)

Apr. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14672

Vol. 13, No. 4, P. 101

New seal consists of multiple plies of braided ceramic sleeves filled with small ceramic balls. Innermost braided sleeve supported by high-temperature-wire-mesh sleeve that provides both springback and preload capabilities. Ceramic balls reduce effect of relatively high porosity of braided ceramic sleeves by acting as labyrinth flow path for gases and thereby greatly increasing pressure gradient seal can sustain. Dynamic, high-temperature, flexible seal employed in hypersonic engines, two-dimensional convergent/divergent and vectorized-thrust exhaust nozzles, reentry vehicle airframes, rocket-motor casings, high-temperature furnaces, and any application requiring non-asbestos high-temperature gaskets.

B89-10198

INTEGRATED HEAT SWITCH/OXIDE SORPTION COMPRESSOR

STEVEN BARD (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17162

Vol. 13, No. 4, P. 102

Thermally-driven, nonmechanical compressor uses container filled with compressed praseodymium cerium oxide powder (PrCeOx) to provide high-pressure flow of oxygen gas for driving closed-cycle Joule-Thomson-expansion refrigeration unit. Integrated heat switch/oxide sorption compressor has no moving parts except check valves, which control flow of oxygen gas between compressor and closed-cycle Joule-Thomson refrigeration system. Oxygen expelled from sorbent at high pressure by evacuating heat-switch gap and turning on heater.

B89-10199

PHASE-CHANGE HEAT-STORAGE MODULE

JAMES C. MULLIGAN (Triangle Research and Development Corp.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26071

Vol. 13, No. 4, P. 103

Heat-storage module accommodates momentary heating or cooling overload in pumped-liquid heat-transfer system. Large heat-storage capacity of module provided by heat of fusion of material that freezes at or near temperature desired to maintain object to be heated or cooled. Module involves relatively small penalties in weight, cost, and size and more than compensates by enabling design of rest of system to handle only average load. Latent heat of fusion of phase-change material provides large heat-storage capacity in small volume.

B89-10200

MAGNETIC COUPLING DELIVERS INCREASED TORQUE

EDWARD L. CARTER (Lockheed Engineering and Management Services Co., Inc.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21171

Vol. 13, No. 4, P. 103

Fixed magnetic pins reduce reluctance of gap in magnetic

coupling. Concentrate flux and increase torque transmitted. Coupling arranged as face or radial drive. Addition of flux pins to gap between magnetically coupled shafts in bioreactor experiment increases transferred torque by almost 50 percent.

B89-10201

THEORY OF BALL-BEARING VIBRATIONS

MICHAEL J. HINE (Rockwell International Corp.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29378

Vol. 13, No. 4, P. 105

Report describes theory of vibrations in shafts supported by worn ball bearings. Purpose of theory to use strain-gauge measurements of vibrations to detect wear. Theory developed from simple model of radial motion of shaft along direction of applied lateral load. Bearing assumed to have clearance. Shaft and outer race taken to be rigid, and either outer race or shaft assumed to be stationary.

B89-10202

TRASH-DISPOSAL MODULE FOR SPACE STATION

DAVID B. WISSINGER (McDonnell-Douglas Corp.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21324

Vol. 13, No. 4, P. 105

Report presents basic engineering concepts of trash-disposal module for Space Station. Module conserves valuable cargo volume and reduces both launching and returning weights of Space Shuttle or other spacecraft carrying materials to and from Space Station. Module relatively cheap and simple to operate.

B89-10203

HEAT FLUX IN A DUAL-THROAT ROCKET ENGINE

R. L. EWEN (Aerojet TechSystems Co.), and C. J. OBRIEN (Aerojet TechSystems Co.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28261

Vol. 13, No. 4, P. 106

Report describes tests of dual-throat rocket engine burning hydrogen in oxygen. In tests, heat-flux profiles measured in inner nozzle and outer chamber. Dual-throat engine being considered for advanced space transportation. Consisting of two combustion chambers in series operating separately or together, engine makes it possible to change mode of operation in flight to obtain performance in most advantageous regime. Produces high thrust at sea level or low thrust with higher performance at high altitudes or in space.

B89-10256

LIQUID ANGULAR-MOMENTUM COMPENSATOR

THEODORE C. ISKENDERIAN (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17204

Vol. 13, No. 5, P. 80

Report discusses use of fluid-loop reaction ring as part of system orienting spacecraft. Proposed device imparts angular rotation to spacecraft by reacting against liquid contained in loop. Pump, or pumps, provide impetus to both spacecraft and fluid. Hydraulic accumulators and valves added to control flow. Technique offers better control than attitude-control thrusters. Several advantages in applications otherwise requiring large, rigid reaction wheel: Fluid loop need occupy only peripheral circulation path; does not necessarily require motor sized for maximum torque; does not require difficult-to-make bearings specified to withstand high

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launch-acceleration loads, provide high stiffness, operate smoothly, and exert minimal fractional torque. Unlike reaction wheel, fluid loop not balanced dynamically.

B89-10315

ROBOT HAND GRIPS CYLINDERS SECURELY

GEORGE F. PARMA

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21365

Vol. 13, No. 6, P. 82

Jaws and linkage accommodate various sizes. Robot hand includes two pairs of parallel jaws that grasp rods, pipes, tubes, struts, and other long, heavy cylindrical objects. Hand features compact rotary drive and butterfly configuration simplifying approach and gripping maneuvers of robot. Parallelogram linkages maintain alignment of each jaw with other jaws. One bar of each linkage connected to one of two concentric, counterrotating shafts; rotation of shafts moves jaws in each pair toward or away from each other to grasp or release workpiece. Each jaw includes rigid gripping pad lined with rubber to give firm grip and to prevent damage to workpiece. Inner cylindrical surface (corner) of each jaw tapers off to flat sides. Enables jaw to grasp workpieces with diameters larger than or equal to twice the corner radius.

B89-10316

ENERGY-EFFICIENT, CONTINUOUS-FLOW ASH LOCKHOPPER

EARL R. COLLINS, JR. (Caltech), JERRY W. SUITOR (Caltech), and DAVID DUBIS (Department of Energy)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16985

Vol. 13, No. 6, P. 83

Pressure balance in control gas prevents loss of reactor gas. Energy efficiency of continuous-flow ash lockhopper increased by preventing hot gases from flowing out of reactor vessel through ash-hopper outlet and carrying away heat energy. Stopping loss of reactor gases also important for reasons other than energy efficiency; desired reaction product toxic or contained to prevent pollution. In improved continuous-flow ash lockhopper, pressure-driven loss of hot gas from reactor vessel through ash-hopper outlet prevented by using control gas in fluidic flow-control device to equalize pressure in reactor vessel. Also enables reactor to attain highest possible product yield with continuous processing while permitting controllable, continuous flow of ash.

B89-10317

THERMAL BRUSHES FOR MEMORY-METAL ACTUATORS

CHARLES WOOD (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17068

Vol. 13, No. 6, P. 84

Thermoelectric elements with wire-brush contacts remove heat from or add heat to memory-metal actuators and thereby enable them to respond faster than previously possible. Memory-metal actuator formed to shape while hot, then to another shape while cold. When cold actuator heated so temperature rises above critical point, snaps from cold shape to hot shape. Upon cooling, actuator returns to cold shape, ready for another cycle. Clearly, faster actuator is heated and cooled, the faster it operates.

B89-10318

CERAMIC BEARINGS FOR GAS-TURBINE ENGINES

ERWIN V. ZARETSKY

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-18007)

LEW-14832

Vol. 13, No. 6, P. 85

Report reviews data from three decades of research on bearings containing rolling elements and possibly other components made of ceramics. Ceramic bearings attractive for use in gas-turbine engines because ceramics generally retain strengths and resistances to corrosion over range of temperatures greater than typical steels used in rolling-element bearings. Text begins with brief description of historical developments in field. Followed by discussion of effects of contact stress on fatigue life of rolling element. Supplemented by figures and tables giving data on fatigue lives of rolling elements made of various materials. Analyzes data on effects of temperature and speed on fatigue lives for several materials and operating conditions. Followed by discussion of related topic of generation of heat in bearings, with consideration of effects of bearing materials, lubrication, speeds, and loads.

B89-10375

MICROENCAPSULATED PHASE-CHANGE MATERIALS FOR STORAGE OF HEAT

DAVID P. COLVIN (Triangle Research and Development Corp.)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27198

Vol. 13, No. 7, P. 72

Report describes research on engineering issues related to storage and transport of heat in slurries containing phase-change materials in microscopic capsules. Specific goal of project to develop lightweight, compact, heat-management systems used safely in inhabited areas of spacecraft. Further development of obvious potential of technology expected to lead to commercialization and use in aircraft, electronic equipment, machinery, industrial processes, and other systems in which requirements for management of heat compete with severe restrictions on weight or volume.

B89-10376

SURVEY OF COOLING TECHNIQUES

CHUNG K. CHAN (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17457

Vol. 13, No. 7, P. 73

Methods of maintaining electronics at best operating temperatures reviewed. Paper surveys cooling techniques for electronic components and sensors that must be kept at temperatures ranging from thousandths of kelvin to room temperature. Discusses characteristics of various coolers in terms of ground and space applications, cooling capacity, reliability, and temperature range. Also discusses briefly, cooling of conventional electronic circuitry operating few degrees above environmental temperature by natural or forced convection of air or liquid. At greater length, discusses passive and active refrigeration of 'cold' electronic circuitry operating below environmental temperature.

B89-10377

PREDICTING FLUTTER OF A PROPFAN

K. R. V. KAZA, O. MEHMED, G. V. NARAYANAN (Sverdrup Technology, Inc.), and D. V. MURTHY (University of Toledo)

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18115)

LEW-14659

Vol. 13, No. 7, P. 74

Report discusses theoretical model and associated computer program for prediction of subsonic bending-torsion cascade flutter in propfans. Predictions of model compared with results of experiments. Additional parametric studies illustrate effects upon flutter speed of steady aeroelastic deformations, angle at which blade set, speed of rotation, structural damping, and number of vibrational modes. Calculations performed by parts of ASTROP computer code: ASTROP 2, based on two-dimensional, subsonic,

unsteady aerodynamics; and ASTROP 3, based on three-dimensional, subsonic, steady and unsteady aerodynamics.

B89-10415

TRANSPIRATION AND REGENERATIVE COOLING OF ROCKET ENGINE

CHARLES J. OBRIEN (Aerojet TechSystems Co.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28251

Vol. 13, No. 8, P. 75

Transpiration cooling extends limits of performance. Addition of transpiration cooling to regeneratively-cooled rocket-engine combustion chamber proposed. Modification improves performance of engine by allowing use of higher chamber pressure. Throat section of combustion-chamber wall cooled by transpiration, while chamber and nozzle sections cooled by fluid flowing in closed channels. Concept applicable to advanced, high-performance terrestrial engines or some kinds of industrial combustion chambers. With proper design, cooling scheme makes possible to achieve higher chamber pressure and higher overall performance in smaller engine.

B89-10416

THREE-POSITION CRYOGENIC ACTUATOR

PETER B. ALLEN (Martin Marietta Corp.), and JAMES WHITE (Martin Marietta Corp.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28265

Vol. 13, No. 8, P. 75

Linear actuator set at one of three positions by supplying gas at suitable pressure. Designed for use as part of relief valve in system storing liquid oxygen. Stops at any of three positions, depending on pressure at supply port. Seals made of polytetrafluoroethylene for low friction at low temperatures. Use of polytetrafluoroethylene and large clearances reduces friction and makes possible operating over range of temperatures from -420 to 250 degree F (-251 to 121 degree C).

B89-10417

SURVEY OF WIND TUNNELS AT LANGLEY RESEARCH CENTER

ROBERT E. BOWER

Aug. 1989 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A86-37087)

LAR-14037

Vol. 13, No. 8, P. 77

Report presented at AIAA 14th Aerodynamic Testing Conference on current capabilities and planned improvements at NASA Langley Research Center's major wind tunnels. Focuses on 14 major tunnels, 8 unique in world, 3 unique in country. Covers Langley Spin Tunnel. Includes new National Transonic Facility (NTF). Also surveys Langley Unitary Plan Wind Tunnel (UPWT). Addresses resurgence of inexpensive simple-to-operate research tunnels. Predicts no shortage of tools for aerospace researcher and engineer in next decade or two.

B89-10468

TWO-PIPE HEAT-TRANSFER LOOP

ROBERT RICHTER (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17404

Vol. 13, No. 9, P. 94

Device like heat pipe transports heat over long distance with negligible loss in temperature, though with considerably smaller total weight. Uses no pumps or other mechanical means to move working fluid. Instead converts part of available thermal energy to

kinetic energy upon vaporization. Vapor carries thermal energy in form of latent heat of vaporization. Delivers thermal energy with drop in temperature of only fraction of degree from source sink.

B89-10469

ROLLER BEARINGS SURVIVE LOSS OF OIL SUPPLY

G. E. KREIDER (Timken Co.), and P. W. LEE (Timken Co.)

Sep. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-11135)

LEW-14749

Vol. 13, No. 9, P. 94

Bearing developed to enable high-speed machinery such as helicopter transmissions to continue to operate safely when oil pump fails. Bearing cup includes porous rib ring containing residual oil supply to lubricate rollers when external oil supply lost. Made by sintering powdered metal, pores of which hold emergency oil.

B89-10470

ZERO-GRAVITY FUEL-CELL PRODUCT-WATER ACCUMULATOR

THOMAS P. BARRERA

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21351

Vol. 13, No. 9, P. 95

Assortment of documents describes simple, passive system that removes water formed from reaction of hydrogen and oxygen in proton-exchange-membrane fuel cell. Designed for use in zero gravity, system does not require any machinery or external source of power. Works by capillary action and differential pressure.

B89-10471

SIMULATOR OF RAIN IN FLOWING AIR

RICHARD M. CLAYTON (Caltech), YOUNG I. CHO (Caltech), PARTHASARATHY SHAKKOTAI (Caltech), and LLOYD H. BACK (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17237

Vol. 13, No. 9, P. 96

Report describes relatively inexpensive apparatus that creates simulated precipitation from drizzle to heavy rain in flowing air. Small, positive-displacement pump and water-injecting device positioned at low-air-speed end of converging section of wind tunnel 10 in. in diameter. Drops injected by array entrained in flow of air as it accelerates toward narrower outlet, 15 in. downstream. Outlet 5 in. in diameter.

B89-10472

IMPROVING A REMOTE MANIPULATOR

JOHN W. HASLAM, JR. (Essex Corp.), NICHOLAS SHIELDS, JR. (Essex Corp.), MARY F. FAGG (Essex Corp.), and RICARDO C. RODRIGUEZ (Essex Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27067

Vol. 13, No. 9, P. 97

Set of three reports describes work on Protoflight Manipulator Assembly (PFMA). 'Performance Characteristics of Protoflight Manipulator Assembly' presents parameters of PFMA after refurbishment of operating components. 'End Effector and Task Board Development for the Protoflight Manipulator Assembly' describes special tools and adaptations allowing PFMA to be used for servicing equipment. 'Modular Software Development for the Protoflight Manipulator Assembly' documents interface and control software for PFMA.

B89-10528**ADAPTIVE CONTROL FOR COOPERATIVE DUAL ROBOT ARMS**

HOMAYOUN SERAJI (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17368**Vol. 13, No. 10, P. 64**

Three strategies proposed for adaptive control of two cooperative robot arms. New dual-arm control strategies implemented at low level of control hierarchy. Each arm operated independently under single-arm control scheme treating forces and torques transmitted through load as though disturbances. Yields promising results in numerical simulations, and general approach extended to greater numbers of arms.

B89-10566**REMOTE-MANIPULATOR HAND WITH DATA-PROCESSING ABILITY**

ANTAL K. BEJCZY (Caltech), HOWARD C. PRIMUS (Caltech), and VICTOR D. SCHEINMAN (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16648**Vol. 13, No. 11, P. 62**

A 'smart' hand for remote manipulator not only senses forces acting on it and detects presence of objects in immediate vicinity but also processes sensory data and controls its gripping claws. Hand reduces computational load on control computer of manipulator system. Includes wrist body and two opposing jaws with sets of claws that mesh with each other. Jaws of hand open as wide as 8.8 cm. Brushless dc motor operates claws through bevel-gear drive train and pair of ball screws. Maximum grip force 540 N, or about 120 lb.

B89-10567**FREQUENCY-DOMAIN MODELING OF DYNAMICS OF HELICOPTERS**

MARK B. TISCHLER

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12283**Vol. 13, No. 11, P. 62**

Method for identification, in frequency domain, of parameters of mathematical models of dynamical behaviors of helicopters combines and extends several existing methods. Focuses on linear-state-space models. Comprehensive frequency-domain method for identification of parameters of mathematical model helicopter involves synthesis of several prior methods.

B89-10618**NASA-ENHANCED VERSION OF AUTOMATICALLY PROGRAMMED TOOL SOFTWARE (APT)**

L. R. PURVES

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12758**Vol. 13, No. 12, P. 48**

APT code one of most widely used software tools for complex numerically-controlled machining. Both a programming language and software that processes language. Upgrades include super pocket for concave polygon pockets and editor to reprocess cutter location coordinates according to user-supplied commands.

B89-10626**DYNAMIC TORQUE CALIBRATION UNIT**

MICHAEL L. AGRONIN (Caltech), and CARL A. MARCHETTO (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17509**Vol. 13, No. 12, P. 56**

Proposed dynamic torque calibration unit (DTCU) measures torque in rotary actuator components such as motors, bearings, gear trains, and flex couplings. Unique because designed specifically for testing components under low rates. Measures torque in device under test during controlled steady rotation or oscillation. Rotor oriented vertically, supported by upper angular-contact bearing and lower radial-contact bearing that floats axially to prevent thermal expansion from loading bearings. High-load capacity air bearing available to replace ball bearings when higher load capacity or reduction in rate noise required.

B90-10028**ARTICULATED SUSPENSION WITHOUT SPRINGS**

DONALD B. BICKLER (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17354**Vol. 14, No. 1, P. 60**

Wheels negotiate bumps and holes with minimal tilting of vehicle body. In new suspension, wheel climbs obstacle as high as 1 1/2 times its diameter without excessive tilting of chassis. Provides highly stable ride over rough ground for such vehicles as wheelchairs, military scout cars, and police and fire robots. System of levers distributes weight to wheels. Sized to distribute equal or other desired portions of load among wheels.

B90-10029**AUTOMATIC CALIBRATION OF MANUAL MACHINE TOOLS**

REX D. GURNEY (Rockwell International Corp.)

Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29380**Vol. 14, No. 1, P. 61**

Modified scheme uses data from multiple positions and eliminates tedious positioning. Modification of computer program adapts calibration system for convenient use with manually-controlled machine tools. Developed for use on computer-controlled tools. Option added to calibration program allows data on random tool-axis positions to be entered manually into computer for reduction. Instead of setting axis to predetermined positions, operator merely sets it at variety of arbitrary positions.

B90-10030**NONOBSTRUCTIVE DAMPING FOR PARTS VIBRATING IN FLOWS**

HAGOP V. PANOSSIAN (Rockwell International Corp.)

Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29572**Vol. 14, No. 1, P. 61**

Vibration-prone parts in fast-flowing liquids or gases damped by simple provision: drill or cast small holes in them and fill holes with particles. Particles absorb vibration energy without obstructing flow. Damping holes add little to cost of manufacturing parts. Reduces masses of parts because masses of inserted particles less than materials removed to make holes.

B90-10073**COMPUTATION OF FLUTTER IN TURBOMACHINERY**

DURBHA V. MURTHY (Toledo Univ.)

Feb. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-28058)'A Computational Procedure for Automated Flutter Analysis'

LEW-14742**Vol. 14, No. 2, P. 56**

'Direct' solution procedure supplants conventional eigenmode analysis. Iterative computational procedure yields critical mach

number for onset of flutter and flutter angular frequency, of propfan, turbine with unshrouded blades, or other turbomachinery. Procedure applied to aeroelastic analysis of propfan, in which finite-element model of propfan structure combined with model of unsteady aerodynamics based on three-dimensional subsonic-lifting-surface theory. Particularly suitable for optimization in design because as optimal design evolves, flutter solution expected to change incrementally, so previous solution provides good estimates for start of current solution.

B90-10108**PREDICTING NOISE FROM WIND TURBINES**

FERDINAND W. GROSVELD (Planning Research Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13984**Vol. 14, No. 3, P. 68**

Computer program WINDY predicts broadband noise spectra of horizontal-axis wind-turbine generators. Enables adequate assessment of impact of broadband wind-turbine noise. Effects of turbulence, trailing-edge wakes, and bluntness taken into account. Program has practical application in design and siting of wind-turbine machines acceptable to community. Written in GW-Basic.

B90-10125**STOWABLE MECHANICAL SOUND SUPPRESSOR**

EDWARD R. THOMPSON (United Technologies Corp.)

Mar. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14158**Vol. 14, No. 3, P. 86**

Stowable sound suppressor conceived for high-speed commercial transport (HSCT) engines. Suppressor is located just aft of variable nozzle of engine. During takeoff, when suppression of noise required, multisegmented system of separators rotates out of center plug across nozzle stream. Actuation accomplished by single ball-screw drive and links, similar to spokes in umbrella. With iris nozzle translated forward, circumferential row of tubes exposed. Pattern of tubes and separators form suppressor configuration. Flow stream through slots and tubes sized to takeoff area. Useful on any turbo-jet engine in which active suppression of sound required.

B90-10126**ROBOT HAND WOULD ADAPT TO CONTOURS**

EARL R. COLLINS, JR. (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16766**Vol. 14, No. 3, P. 86**

Conceptual device uses hydraulic pressure to activate fingers. Projections on opposing fingers of proposed robot hand automatically conform to contours of object on contact. Pistons connected to common reservoir provide gentle, firm grip. Fingers communicate with each other via hydraulic pressure, without elaborate control system. Pistons move in and out, and tips slope to match contour of object. Their action tends to center object on finger. Hand used to grasp objects of various shapes and sizes. Conforming process passive; pressure of object on one or several pad elements forces other pad elements to touch it. Would not use elaborate mechanisms involving motors, cams, and cables.

B90-10127**ELECTROSTATIC LINEAR ACTUATOR**

EARL R. COLLINS, JR. (Caltech), and KENNETH C. CURRY (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-17684**Vol. 14, No. 3, P. 87**

Electrically charged helices attract or repel each other. Proposed electrostatic linear actuator made with intertwined dual helices, which holds charge-bearing surfaces. Dual-helix configuration provides relatively large unbroken facing charged surfaces (relatively large electrostatic force) within small volume. Inner helix slides axially in outer helix in response to voltages applied to conductors. Spiral form also makes components more rigid. Actuator conceived to have few moving parts and to be operable after long intervals of inactivity.

B90-10176**ELECTROMAGNETIC MEISSNER-EFFECT LAUNCHER**

GLEN A. ROBERTSON

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28323**Vol. 14, No. 4, P. 64**

Proposed electromagnetic Meissner-effect launching apparatus differs from previous electromagnetic launchers; no need for electromagnet coil on projectile. Result, no need for brush contacts and high-voltage commutation equipment to supply current directly to projectile coil, or for pulse circuitry to induce current in projectile coil if brush contacts not used. Compresses magnetic field surrounding rear surface of projectile, creating gradient of magnetic pressure pushing projectile forward.

B90-10177**ARRAY OF ROCKETS FOR MULTICREW MEMBER EVACUATION**

MARGARET A. ALLEN (Rockwell International Corp.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21332**Vol. 14, No. 4, P. 64**

Emergency egress system undergoing development for aircraft and aerospace vehicles uses fixed array of tractor rockets to eject crewmembers. Crewmembers hook up to tractor rockets and fire them unaided. Positioned as unit in ready-to-use orientation during flight operations. On ground, swung out of way. Rocket array also mounts under exit hatch, serving as egress ramp.

B90-10178**SERIAL ESCAPE SYSTEM FOR AIRCRAFT CREWS**

KENNETH E. WOOD (Rockwell International Corp.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21310**Vol. 14, No. 4, P. 65**

Emergency escape system for aircraft and aerospace vehicles ejects up to seven crewmembers, one by one, within 120 s. Intended for emergencies in which disabled craft still in stable flight at no more than 220 kn (113 m/s) equivalent airspeed and sinking no faster than 110 ft/s (33.5 m/s) at altitudes up to 50,000 ft (15.2 km). Ejection rockets load themselves from magazine after each crewmember ejected. Jumpmaster queues other crewmembers and helps them position themselves on egress ramp. Rockets pull crewmembers clear of aircraft structure. Provides orderly, controlled exit and avoids ditching at sea or landing in rough terrain.

B90-10179**WRAPPED WIRE DETECTS RUPTURE OF PRESSURE VESSEL**

JAMES B. HUNT (Rockwell International Corp.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

07 MACHINERY

MSC-21449 Vol. 14, No. 4, P. 66

Simple, inexpensive technique helps protect against damage caused by continuing operation of equipment after rupture or burnout of pressure vessel. Wire wrapped over area on outside of vessel where breakthrough most likely. If wall breaks or burns, so does wire. Current passing through wire ceases, triggering cutoff mechanism stopping flow in vessel to prevent further damage. Applied in other situations in which pipes or vessels fail due to overpressure, overheating, or corrosion.

B90-10180 **IMPROVED STRESS ANALYSIS OF MULTICOMPONENT ROTORS**

GERALD A. CAREK

Apr. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-25935) 'Improved Method for Stress and Compatibility Analysis of Multicomponent Rotating Systems'

LEW-14838 Vol. 14, No. 4, P. 67

Suitable formulation of finite-element model speeds computation. Improved method developed for analysis of stress and compatibility of components in multicomponent rotating assembly. In method, single finite-element mathematical model represents all of components. Made possible by use of gap elements to represent contact surfaces between components.

B90-10181 **TWO-PHASE ACCUMULATOR**

CHARLES E. KALB (Grumman Aerospace Corp.), ROBERT L. KOSSON (Grumman Aerospace Corp.), JOSEPH P. ALARIO (Grumman Aerospace Corp.), RICHARD F. BROWN (Grumman Aerospace Corp.), and FRED EDLESTEIN (Grumman Aerospace Corp.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21464 Vol. 14, No. 4, P. 68

Two-phase accumulator maintains pressure and temperature in thermal-bus system within predetermined range during variations in heat load on system. Stores liquid and vapor ammonia. Exchanges liquid ammonia with condenser to adjust level of liquid in condenser. Prototype has capacity of 13 gallons (49 liters). Simple and highly reliable. Responds quickly, restoring pressure and temperature to proper values within minutes. Low in cost and requires little further development. Used to dispose of waste heat, such as that from electronic equipment or power-plant.

B90-10182 **HARD CONTACT WITH A FORCE-REFLECTING TELEOPERATOR**

BLAKE HANNAFORD (Caltech), and ROBERT ANDERSON (Illinois Univ.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17549 Vol. 14, No. 4, P. 70

Force feedback adjusted to provide stability without sluggish and fatiguing operation. Paper reports on experiments with single-axis force-reflecting teleoperator that made contact with hard, immovable object. Experiments show that dynamics of human operator affect stability of response of control system.

B90-10183 **VIBRATIONS CAUSED BY CRACKED TURBOPUMP BEARING RACE**

DAVID G. GOGGIN (Rockwell International Corp.), and ROBERT A. DWECK (Rockwell International Corp.)

Apr. 1990 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29656 Vol. 14, No. 4, P. 71

Expansion gives rise to eccentricity. Report presents analysis of dynamic effects caused by cracking of inner race of ball bearing in turbopump. Crack manifested itself via increase in vibrations synchronous with rotation and smaller increase at twice frequency of rotation. Analysis conducted to verify these increases were caused solely by crack and to understand implications for future such cracks.

B90-10241 **STABILIZING WHEELS FOR ROVER VEHICLE**

EARL R. COLLINS, JR. (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17495 Vol. 14, No. 5, P. 74

Proposed articulated, normally-four-wheeled vehicle holds extra pair of wheels in reserve. Deployed to lengthen wheelbase on slopes, thereby making vehicle more stable, and to aid vehicle in negotiating ledge or to right vehicle if turned upside down. Extra wheels are drive wheels mounted on arms so they pivot on axis of forward drive wheels. Both extra wheels and arms driven by chains, hydraulic motors, or electric motors. Concept promises to make remotely controlled vehicles more stable and maneuverable in such applications as firefighting, handling hazardous materials, and carrying out operations in dangerous locations.

B90-10242 **MODIFICATION OF GEAR TEETH TO REDUCE VIBRATIONS** DENNIS P. TOWNSEND, FRED B. OSWALD, and HSIANG HSI LIN (Memphis State Univ.)

May 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-28918) 'Profile Modification To Minimize Spur Gear Dynamic Loading'

LEW-14738 Vol. 14, No. 5, P. 75

Computer simulations yield data useful in designing for low noise. Effects of modifications in shape of gear teeth upon static transmission error and dynamic loading of gears now analyzed systematically. Design curves generated by conducting numerical simulations of dynamic effects at successive incremental modifications of gear systems operated at various applied loads. Modifications that result in minimum dynamic effect determined from design curves.

B90-10243 **BACK-TO-BACK, COUNTERROTATING TURBOPUMPS**

ALFRED M. PALGON (United Technologies Corp.), BRUCE R. BRANSTMOM (United Technologies Corp.), and FRANK N. BURG (United Technologies Corp.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28349 Vol. 14, No. 5, P. 76

Pair of counterrotating turbopumps mounted back to back in novel one-piece volute housing. Serves as spool piece into which pumps inserted, one from each end. Includes turbine inlet and outlet volutes. Enables easy replacement of each pump/turbine assembly. Designed to provide fuel and oxidizer to rocket engine at high pressures; modified versions useful in providing other two-fluid high-pressure flows or redundant high-pressure flow of single fluid.

B90-10244 **DESIGN OF ROBOTS FOR OUTER SPACE**

GERALD P. ROSTON (Caltech)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-17113**Vol. 14, No. 5, P. 76**

Report discusses design of robots for use in zero gravity and vacuum, with attention to differences between requirements imposed on designs by outer space and by terrestrial applications. Terrestrial robots designed for multiple purposes and for minimal cost. Outer-space robots designed specialized to one task where cost has relatively low priority. Design optimal in one environment unlikely optimal in another.

B90-10294**REMOTELY-CONTROLLED VARIABLE-ORIFICE VALVE**

OLEN E. HILL

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28369**Vol. 14, No. 6, P. 75**

Remotely-controlled variable-orifice valve used to adjust back pressure in tests of flow of air in duct. Disk with holes rotated on fixed disk with similar holes to adjust cross sectional area available to flow. Features include compactness and reduction of perturbation. Moved easily from one flow-test facility to another.

B90-10295**HETEROPOLAR MAGNETIC SUSPENSION**

KATHLEEN MISOVEC (SatCon Technology Corp.), BRUCE JOHNSON (SatCon Technology Corp.), JAMES DOWNER (SatCon Technology Corp.), DAVID EISENHAURE (SatCon Technology Corp.), and RICHARD HOCKNEY (SatCon Technology Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26096**Vol. 14, No. 6, P. 75**

Compact permanent-magnet/electromagnet actuator has six degrees of freedom. Heteropolar magnetic actuator conceived for use as actively controlled vibration-isolating suspension device. Exerts forces along, and torques about, all three principal coordinate axes to resist all three components of translational vibration and all three components of rotational vibration. Inner cylinder suspended magnetically within outer cylinder. Electro-magnet coils interact with fields of permanent magnets to provide active control of suspending force and torque.

B90-10296**INERTIA-WHEEL VIBRATION-DAMPING SYSTEM**

JOSEPH V. FEDOR

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13077**Vol. 14, No. 6, P. 76**

Proposed electromechanical system would damp vibrations in large, flexible structure. In active vibration-damping system motors and reaction wheels at tips of appendages apply reaction torques in response to signals from accelerometers. Velocity signal for vibrations about one axis processes into control signal to oppose each of n vibrational modes. Various modes suppressed one at a time. Intended primarily for use in spacecraft that has large, flexible solar panels and science-instrument truss assembly, embodies principle of control interesting in its own right and adaptable to terrestrial structures, vehicles, and instrument platforms.

B90-10297**ROTARY STIRLING-CYCLE ENGINE AND GENERATOR**

JOSEPH A. CHANDLER

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21530**Vol. 14, No. 6, P. 78**

Proposed electric-power generator comprises three motor generators coordinated by microprocessor and driven by rotary Stirling-cycle heat engine. Combination offers thermodynamic efficiency of Stirling cycle, relatively low vibration, and automatic adjustment of operating parameters to suit changing load on generator. Rotary Stirling cycle engine converts heat to power via compression and expansion of working gas between three pairs of rotary pistons on three concentric shafts in phased motion. Three motor/generators each connected to one of concentric shafts, can alternately move and be moved by pistons. Microprocessor coordinates their operation, including switching between motor and generator modes at appropriate times during each cycle.

B90-10298**SECURING BEARING RACES TO TURBOPUMP SHAFTS**

DALE H. BLOUNT

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28384**Vol. 14, No. 6, P. 79**

Proposed method of attaching inner race of roller bearing to shaft prevents loosening now caused by difference between coefficients of thermal expansion of race and shaft materials. Intended for cryogenic turbopump in which race made of 440C stainless-steel alloy and shaft made of Inconel(R) 100 nickel alloy. Flanges of race replaced by tension bands that shrink faster as they are cooled. Tension band engages race on slightly sloping surface so axial forces do not dislodge it.

B90-10299**MECHANISM FOR GUIDED RELEASE**

RICHARD A. KULL (General Electric Co.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17617**Vol. 14, No. 6, P. 80**

Proposed mechanism retains protective shield until no longer needed, then releases shield and guides it away for safe ejection from vehicle (spacecraft, according to original concept). Intended for use with shield like one described in article 'Crash-Resistant Shield' (NPO-17616). Mechanism for guided release separates shield from base and from supporting truss on command. Band holding shield on base released by explosive separator.

B90-10363**TESTING BEARING BALLS FOR IGNITION IN LIQUID OXYGEN**

WILLIAM R. WAGNER (Rockwell International Corp.), CONSTANTINE PEROULIAS (Rockwell International Corp.), and LOUIS H. PIDCOKE (Rockwell International Corp.)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29410**Vol. 14, No. 7, P. 75**

Inexpensive, safe apparatus built to test cooling by, ignition in, and nucleate boiling to film boiling of liquid oxygen flowing around ball bearings. Provides for heating of bearing specimens, direct observations, and measurements of temperatures and temperature distributions by thermocouples and infrared sensors. Used to evaluate suitability of various materials and surface treatments for ball bearings in high-pressure liquid-oxygen turbopumps. Ball rests in fixture while liquid oxygen flows around it. Flow reversed so observer or infrared sensor can view phenomena on trailing or leading side of ball.

B90-10364**RUBBING BETWEEN ROTORS AND STATORS**

AGNES MUSZYNSKA (Bently Nevada Corp.), DONALD E. BENTLY

07 MACHINERY

(Bently Nevada Corp.), WESLEY D. FRANKLIN (Bently Nevada Corp.), ROBERT D. HAYASHIDA (Bently Nevada Corp.), LORI M. KINGSLEY (Bently Nevada Corp.), and ARTHUR E. CURRY (Bently Nevada Corp.)

Jul. 1990 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

MFS-27226 Vol. 14, No. 7, P. 76

Report describes experimental and numerical-simulation studies of dynamical effects of rubbing between rotors and stators in turbomachinery. Purpose of study to gain improved understanding of such rubbing phenomena, with view toward: contributing to techniques for diagnosis of rubbing (e.g., via analysis of vibrations); predicting more accurately limiting operating conditions; and improving design criteria to prevent rubbing damage in high-performance rotating machinery.

B90-10365

AEROBRAKES FOR A MANNED MARS MISSION

G. P. MENEES

Jul. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-11700) 'Aeroassisted-Vehicle Design Studies For A Manned Mars Mission'

ARC-12117 Vol. 14, No. 7, P. 78

Paper presents results of study of aerobraking in manned mission to Mars. Describes geometry and aerodynamic characteristics of aerobraked vehicle. Discusses computer program, WTRAJ, used to simulate trajectories near planets. Analyzes aerocapture processes for both Mars and Earth. Examines mass efficiency, or saving in propellant mass, afforded by aerobraking.

B90-10419

PIEZOELECTRIC PUSHERS SUPPRESS VIBRATIONS

ALBERT F. KASCAK

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14927 Vol. 14, No. 8, P. 59

Vibration-suppressing control systems including piezoelectric actuators undergoing development. Small, lightweight, and rugged. Requires simpler electronic control subsystems and does not require large electromagnet coils. Continues to provide support and some passive damping even when electronic control subsystems or power supplies fail. Intended primarily to enhance safety and prevent damage in rotating machinery by sensing and counteracting vibrations. Useful in suppressing unpredictable vibrations caused by changes in loads, losses of rotating components and consequent imbalances in rotors, and ingestion of foreign objects into turbines.

B90-10420

ROTOR/STATOR INTERACTION IN A DIFFUSER PUMP

A. J. ACOSTA (Caltech), C. E. BRENNAN (Caltech), and T. K. CAUGHEY (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26092 Vol. 14, No. 8, P. 60

Measurements of steady and fluctuating pressures reported. Report describes experiments designed to investigate interactions between blades of impeller and both vaned and vaneless diffuser (stator) in diffuser pump.

B90-10421

OZONE TREATMENT FOR COOLING TOWERS

RICK BLACKWELDER, LEROY V. BALDWIN (EG and G, Inc.), and ELLEN S. FEENEY (EG and G, Inc.)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11384 Vol. 14, No. 8, P. 60

Report presents results of study of cooling tower in which water treated with ozone instead of usual chemical agents. Bacteria and scale reduced without pollution and at low cost. Operating and maintenance costs with treatment about 30 percent of those of treatment by other chemicals. Corrosion rates no greater than with other chemicals. Advantage of ozone, even though poisonous, quickly detected by smell in very low concentrations.

B90-10422

SHOCK-ABSORBING, RETRACTABLE DOCKING MECHANISM

JON B. KAHN

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21327 Vol. 14, No. 8, P. 61

Report contains description and drawings of conceptual docking mechanism joining Space Shuttle orbiter with proposed Space Station. New version saves considerable weight. Docking module left on Space Shuttle after assembly, and only docking mechanism carried aboard Space Shuttle.

B90-10483

DAMPING SEALS AND BEARINGS FOR A TURBOMACHINE

GEORGE L. VON PRAGENAU

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28345 Vol. 14, No. 9, P. 80

Improved design for support of rotor in turbopump integrates ball bearings with damping seals and damping bearings. Reduces radial (side) loads on ball bearings, making it possible to increase contact angles to withstand increased transient axial loads. Service lives of bearings prolonged.

B90-10484

CIVIL APPLICATIONS FOR NEW V/STOL AND STOL

AIRCRAFT

JAMES A. ALBERS, and JOHN ZUK

Sep. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-11643) 'Civil Applications of High-Speed Rotorcraft and Powered-Lift Aircraft Configurations.'

ARC-12175 Vol. 14, No. 9, P. 81

New designs offer benefits in congested urban areas and remote regions. Report explores potential uses in civil aviation of advanced rotorcraft, vertical/short-takeoff-and-landing (V/STOL) aircraft, and short-takeoff-and-landing (STOL) aircraft. Future opportunities overcome formidable geographic barriers and lack of major airport facilities, bringing fast, flexible transportation to remote areas. Aircraft relieves congestion at airports in densely populated areas by utilizing pads and short runways without interfering with large-air-carrier traffic.

B90-10485

THRUST-VECTOR DEFLECTORS FOR SPACECRAFT

WILLIAM C. SOONG (McDonnell-Douglas Corp.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21672 Vol. 14, No. 9, P. 81

Rotating shield steers thrust in desired direction. Report discusses use of thrust-vector deflectors (TVD's) to enhance controllability and reduce number of small rocket engines (thrusters) needed to control attitudes of artificial satellites. Developed in

aircraft industry for use in jet engines. Principal advantages gained, lower cost and greater simplicity.

B90-10486**LIQUID-RING ATTITUDE-CONTROL SYSTEM FOR SPACECRAFT**

BORIS J. LURIE (Caltech), and J. ALAN SCHIER (Caltech)
Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17485**Vol. 14, No. 9, P. 82**

Angular momentum transferred to liquid flowing in rings of tubing. Proposed fluid-ring actuator used to orient spacecraft. Used instead of rotating inertia wheels. Meets need for pointing system of low mass, low power, and high resolution. Advantage of actuator, rings of tubing routed through existing structures, minimizing required space and mass.

B90-10538**CAPILLARY PUMPED LOOP MODELER**

JENTUNG KU (OAO Corp.), ELLIOT ITKIN (OAO Corp.), RUSSELL B. SCHWEICKART, and LAURA OTTENSTEIN

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13145**Vol. 14, No. 10, P. 76**

Capillary Pumped Loop (CPL) Modeler computer program is amalgamation of software that mathematically models performance of CPL system and its environment. Two-phase heat-transport device capable of transferring heat loads efficiently over large distance with little temperature differential. Utilizes surface-tension forces established in fine-pore capillary wick to circulate working fluid, requiring no external pumping power. Predicts steady-state or quasi-steady behavior of CPL embedded in spacecraft or other thermal environment. Also predicts location of liquid/vapor interface in each condenser. Written in VAX/VMS FORTRAN 77.

B90-10549**VENTURI AIR-JET VACUUM EJECTOR FOR SAMPLING AIR**

GERALD F. HILL, GLEN W. SACHSE, L. GARLAND BURNEY, and LARRY O. WADE (Planning Research Corp.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14024**Vol. 14, No. 10, P. 86**

Venturi air-jet vacuum ejector pump light in weight, requires no electrical power, does not contribute heat to aircraft, and provides high pumping speeds at moderate suction. High-pressure motive gas required for this type of pump bled from compressor of aircraft engine with negligible effect on performance of engine. Used as source of vacuum for differential-absorption CO-measurement (DACOM), modified to achieve in situ measurements of CO at frequency response of 10 Hz. Provides improvement in spatial resolution and potentially leads to capability to measure turbulent flux of CO by use of eddy-correlation technique.

B90-10550**CONTROL-VOLUME ANALYSIS OF THRUST-AUGMENTING EJECTORS**

COLIN K. DRUMMOND (Sverdrup Technology, Inc.)

Oct. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-12566)'A Control-Volume Method For Analysis Of Unsteady Thrust Augmenting Ejector Flows.'

LEW-14877**Vol. 14, No. 10, P. 87**

New method of analysis of transient flow in thrust-augmenting ejector based on control-volume formulation of governing

equations. Considered as potential elements of propulsion subsystems of short-takeoff/vertical-landing airplanes.

B90-10551**INCREASING THE DEXTERITY OF REDUNDANT ROBOTS**

HOMAYOUN SERAJI (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17801**Vol. 14, No. 10, P. 88**

Redundant coordinates used to define additional tasks. Configuration control emerging as effective way to control motions of robot having more degrees of freedom than necessary to define trajectory of end effector and/or of object to be manipulated. Extra or redundant degrees of freedom used to give robot humanlike dexterity and versatility.

B90-10589**SYSTEMS IMPROVED NUMERICAL FLUIDS ANALYSIS CODE**

F. A. COSTELLO (Frederick A. Costello, Inc.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13231**Vol. 14, No. 11, P. 64**

Systems Improved Numerical Fluids Analysis Code, SINFAC, consists of additional routines added to April, 1983, version of SINDA. Additional routines provide for mathematical modeling of active heat-transfer loops. Simulates steady-state and pseudo-transient operations of 16 different components of heat-transfer loops, including radiators, evaporators, condensers, mechanical pumps, reservoirs, and many types of valves and fittings. Program contains property-analysis routine used to compute thermodynamic properties of 20 different refrigerants. Source code written in FORTRAN 77.

B90-10604**HYDROMECHANICAL ADVANCED COAL EXCAVATOR**

JAY M. ESTUS (Caltech), and DAVID SUMMERS (Missouri Univ.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16442**Vol. 14, No. 11, P. 80**

Water-jet cutting reduces coal dust and its hazards. Advanced mining system utilizes full-face, hydromechanical, continuous miner. Coal excavator uses high-pressure water-jet lances, one in each of cutting heads and one in movable lance, to make cuts across top, bottom and middle height, respectively, of coal face. Wedge-shaped cutting heads advance into lower and upper cuts in turn, thereby breaking coal toward middle cut. Thrust cylinders and walking pads advance excavator toward coal face.

B90-10663**AGILE WALKING ROBOT**

STANLEY J. LARIMER (Martin Marietta Corp.), THOMAS R. LISEC (Martin Marietta Corp.), ANDREW J. SPIESSBACH (Martin Marietta Corp.), and KENNETH J. WALDRON (Martin Marietta Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17874**Vol. 14, No. 12, P. 52**

Proposed agile walking robot operates over rocky, sandy, and sloping terrain. Offers stability and climbing ability superior to other conceptual mobile robots. Equipped with six articulated legs like those of insect, continually feels ground under leg before applying weight to it. If leg sensed unexpected object or failed to make contact with ground at expected point, seeks alternative position within radius of 20 cm. Failing that, robot halts, examines area around foot in detail with laser ranging imager, and replans entire cycle of steps for all legs before proceeding.

07 MACHINERY

B90-10664

ROLLING ROBOT

STANLEY J. LARIMER (Martin Marietta Corp.), THOMAS R. LISEC (Martin Marietta Corp.), and ANDREW J. SPIESSBACH (Martin Marietta Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17842

Vol. 14, No. 12, P. 52

Proposed rolling robot routinely traverses rough terrain, clearing rocks as high as 1 m. Climbs steps 1 m high and spans ditches 2.3 m wide. Simple but rugged semiautonomous rover has large wheels and articulated body. With combined yaw, roll, and four-wheel drive, robot crawls slowly to pass over soft or sandy terrain. Senses terrain along corridor, chooses path to avoid insurmountable obstacles, and monitors state of vehicle for unexpected hazards.

B90-10665

RUGGED WALKING ROBOT

STANLEY J. LARIMER (Martin Marietta Corp.), THOMAS R. LISEC (Martin Marietta Corp.), and ANDREW J. SPIESSBACH (Martin Marietta Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17825

Vol. 14, No. 12, P. 53

Proposed walking-beam robot simpler and more rugged than articulated-leg walkers. Requires less data processing, and uses power more efficiently. Includes pair of tripods, one nested in other. Inner tripod holds power supplies, communication equipment, computers, instrumentation, sampling arms, and articulated sensor turrets. Outer tripod holds mast on which antennas for communication with remote control site and video cameras for viewing local and distant terrain mounted. Propels itself by raising, translating, and lowering tripods in alternation. Steers itself by rotating raised tripod on turntable.

B90-10666

HEAT SHIELD AND AXIAL RETAINER FOR TURBOPUMP BLADE

JERRY H. MOORE (United Technologies Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28417

Vol. 14, No. 12, P. 53

Modified configuration for axial retention of blades of cryogenic turbopump expected to reduce dynamic and thermal stresses, thereby increasing operating life. Expected to overcome some of structural limitations in which various components of 'fir-tree' blade/disk attachments shaped in such way as to concentrate stresses. Advantages include: No overhung loading on attachment faces of disk or blades; No additional stress concentrators added to attachment faces of disk or blades; and No large axial thermal gradients on edges of disk and blades.

B90-10667

COMPUTING FLOWS IN TURBINE END BEARINGS

TYN S. SMITH (Rockwell International Corp.)

Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29681

Vol. 14, No. 12, P. 54

Computer program implements mathematical model of flow through turbine and bearings of high-pressure-oxygen turbopump of Space Shuttle main engine. Intended to determine rate of flow and margin before vaporization in these bearings for various types of geometries. Effects of hydrostatic damper and/or back-pressure seal included. Modified for application to other turbomachines and fluids other than oxygen.

B90-10668

ROTARY BALL LOCKING MECHANISM

EARL V. HOLMAN (Rockwell International Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21396

Vol. 14, No. 12, P. 56

Ball locking mechanism links input drive shaft to output shaft and disengages two shafts from each other when it locks output shaft at either of two fixed angular positions. Part of drive system turning microwave antenna 143.5 degrees between stowage and employment orientations and holds it at either orientation without back-loading drive motor and gears. Angular interval and dimensions modified for use in robotic or other actuators in which desirable to 'rest' drive trains while locking actuators at fixed positions.

08 FABRICATION TECHNOLOGY

B86-10080

ATTACHING METAL FASTENERS TO SILICA TILES

J. W. HOLT (Rockwell International Corp.), S. Y. YOSHINO (Rockwell International Corp.), and L. W. SMISER (Rockwell International Corp.)

Jun. 1986

MSC-20537

Vol. 10, No. 1, P. 122

Stress distributed so high load borne. Fastener bonded in densified hole or captured in plug of similar refractory material, which in turn bonded in hole in parent tile. Plug or bonding distributes mechanical load from fastener to broad region surrounding fastener, reducing local stress concentration and likelihood of breakage. Bonded-plug method has been successful in attaching mechanical fasteners to porous silica refractory tiles used on outer surface of Space Shuttle orbiter.

B86-10081

COMPACT PLASMA DEPOSITION CHAMBER

D. B. BICKLER (Caltech)

Jun. 1986

NPO-16469

Vol. 10, No. 1, P. 123

Contamination and nonuniformity are reduced. Substrates serve as walls of deposition chamber in configuration for plasma deposition of amorphous silicon. New chamber intended for production of amorphous silicon solar cells. Design reduces requirements on chamber size and expected to increase product quality.

B86-10082

LUBRICATING HOLES FOR CORRODED NUTS AND BOLTS

B. G. PENN, J. M. CLEMONS, and FRANK E. LEDBETTER, III

Jun. 1986

MFS-28086

Vol. 10, No. 1, P. 123

Corroded fasteners taken apart more easily. Lubricating holes bored to thread from three of flats. Holes facilitate application of penetrating oil to help loosen nut when rusted onto bolt. Holes make it possible to apply lubricants and rust removers directly to more of thread than otherwise reachable.

B86-10083**RAPID ADHESIVE BONDING OF COMPOSITES**

B. A. STEIN, J. R. TYERYAR, R. L. FOX, S. ELMO STERLING, JR., J. D. BUCKLEY, SPENCER V. INGE, JR., L. G. BURCHER, and ROBERT E. WRIGHT, JR.

Jun. 1986 See Also (N84-29968)

LAR-13277

Vol. 10, No. 1, P. 124

Strong bonds created in less time and with less power than use of conventional bonding methods. Rapid adhesive bonding (RAB) technique for composites uses high-frequency induction heating toroids to quickly heat metallic susceptor impregnated with thermoplastic adhesive or sandwiched between thermoset or thermoplastic adhesive cloths or films. Susceptor steel screen or perforated steel foil.

B86-10084**SOLAR-CELL-JUNCTION PROCESSING SYSTEM**

S. N. BUNKER (Spire Corporation), and A. J. ARMINI (Spire Corporation)

Jun. 1986

NPO-16540

Vol. 10, No. 1, P. 125

System under development reduces equipment costs. Processing system will produce solar-cell junctions on 4 in. (10.2 cm) round silicon wafers at rate of 10 to seventh power per year. System includes non-mass-analyzed ion implanter, microcomputer-controlled, pulsed-electron-beam annealer, and wafertransport system with vacuum interlock. These features eliminate large, expensive magnet and plates, circuitry, and power source otherwise needed for scanning.

B86-10085**LEAKPROOF SWAGED JOINTS IN THIN-WALL TUBING**

F. H. STUCKENBERG (Rockwell International Corp.), L. K. CROCKETT (Rockwell International Corp.), and W. E. SNYDER (Deutsch Co.)

Jun. 1986

MSC-20882

Vol. 10, No. 1, P. 126

Tubular inserts reinforce joints, reducing incidence of leaks. In new swaging technique, tubular inserts placed inside ends of both tubes to be joined. Made from thicker-wall tubing with outside diameter that matches inside diameter of thin tubing swaged, inserts support tube ends at joint. They ensure more uniform contact between swage fitting and tubing. New swaging technique developed for Al/Ti/V-alloy hydraulic supply lines.

B86-10086**DETECTING CONTAMINANT PARTICLES ACOUSTICALLY**

L. M. WYETT (Rockwell International Corp.)

Jun. 1986

MFS-29078

Vol. 10, No. 1, P. 127

Apparatus 'listens' for particles in interior of complex turbomachinery. Contact microphones are attached at several points on pump housing. Acoustic transducer also attached to housing to excite entire pump with sound. Frequency of sound is slowly raised until pump resonates. Microphones detect noise of loose particles scraping against pump parts. Such as machining chips in turbopumps or other machinery without disassembly.

B86-10087**FINDING BRAZING VOIDS BY HOLOGRAPHY**

R. GALLUCCIO (United Technologies Corp.)

Jun. 1986

MSC-20495

Vol. 10, No. 1, P. 127

Vibration-induced interference fringes reveal locations of defects. Holographic apparatus used to view object while vibrated ultrasonically. Interference fringes in hologram reveal brazing defects. Holographic technique locates small voids in large brazed

joints. Identifies unbrazed regions 1 in. to second power (6 cm to the second power) or less in area.

B86-10088**ELECTROMAGNETIC HAMMER FOR METALWORKING**

S. A. ANDERSON (Martin Marietta Corp.), F. BRUNET (Martin Marietta Corp.), A. DOWD (Martin Marietta Corp.), R. DURHAM (Martin Marietta Corp.), J. EZELL (Martin Marietta Corp.), G. GORR (Martin Marietta Corp.), D. HARTLEY (Martin Marietta Corp.), F. JACKSON (Martin Marietta Corp.), J. MARCHAND (Martin Marietta Corp.), W. MACFARLANE (Martin Marietta Corp.) et al.

Jun. 1986

MFS-27096

Vol. 10, No. 1, P. 128

High eddy currents apply pressure for cold-forming. Coil housing constructed for mechanical strength to hold coil against magnetic force, to maintain electrical contact with coil ends, and to maintain insulation between coil turns. Drilled holes placed to facilitate release of bubbles during potting. In contrast with mechanical hammers, electromagnetic hammer requires no dynamic material contact with workpiece; consequently, produces almost no change in metal grain structure.

B86-10089**FORGING OXIDE-DISPERSION-STRENGTHENED SUPERALLOYS**

F. H. HARF, T. K. GLASGOW, D. J. MORACZ (TRW, Inc.), and C. M. AUSTIN (TRW, Inc.)

Jun. 1986 See Also (N84-25711)

LEW-14179

Vol. 10, No. 1, P. 129

Cladding of mild steel prevents surface cracking when alloy contacts die. Continual need for improvements in properties of alloys capable of withstanding elevated temperatures. Accomplished by using oxidizedispersion-strengthened superalloys such as Inconel Alloy MA 6000. Elevated tensile properties of forged alloy equal those of hot-rolled MA 6000 bar. Stress-rupture properties somewhat lower than those of bar stock but, at 1,100 degrees C, exceed those of strongest commercial single crystal, directionally solidified and conventionally cast superalloys.

B86-10090**ACOUSTIC-EMISSION WELD-PENETRATION MONITOR**

J. MARAM (Rockwell International Corp.), and J. COLLINS (Rockwell International Corp.)

Jun. 1986

MFS-29064

Vol. 10, No. 1, P. 135

Weld penetration monitored by detection of high-frequency acoustic emissions produced by advancing weld pool as it melts and solidifies in workpiece. Acoustic emission from TIG butt weld measured with 300-kHz resonant transducer. Rise in emission level coincides with cessation of weld penetration due to sudden reduction in welding current. Such monitoring applied to control of automated and robotic welders.

B86-10091**HOLDER FOR TINNING MICROCIRCUIT LEADS**

G. G. GILBERT (Sperry Rand Corp.), and G. D. FIELDER (Sperry Rand Corp.)

Jun. 1986

MSC-20662

Vol. 10, No. 1, P. 136

Heat-sinking tool holds microcircuits for lead tinning while protecting circuits from heat of tinning solder. Microcircuit holder dips leads in molten solder. Holder shields microcircuit from solder heat while leads immersed and absorbs heat conducted through leads. Thus keeps microcircuit relatively cool. Application tool was developed for requires tinning not closer than 0.02 in. (0.5 mm) from package body or its glass seals.

08 FABRICATION TECHNOLOGY

B86-10092

IMPROVEMENTS IN IONIZED CLUSTER-BEAM DEPOSITION

D. J. FITZGERALD (Caltech), L. E. COMPTON (Caltech), and E. V. PAWLIK (Caltech)

Jun. 1986

NPO-16518

Vol. 10, No. 1, P. 137

Lower temperatures result in higher purity and fewer equipment problems. In cluster-beam deposition, clusters of atoms formed by adiabatic expansion nozzle and with proper nozzle design, expanding vapor cools sufficiently to become supersaturated and form clusters of material deposited. Clusters are ionized and accelerated in electric field and then impacted on substrate where films form. Improved cluster-beam technique useful for deposition of refractory metals.

B86-10093

HERMETIC EDGE SEALS FOR PHOTOVOLTAIC MODULES

M. J. NOWLAN (Spire Corp.)

Jun. 1986

NPO-16427

Vol. 10, No. 1, P. 138

Corrosive atmospheric agents excluded to prolong cell life. Combination of two sealing techniques makes possible to protect solar cells from water vapor, oxygen, and other corrosive atmospheric constituents. Using three-step process, glass-to-metal hermetic seal formed around edge of solar-cell module. Elastomer seals used previously not as effective because they are permeable to water vapor and atmospheric gases.

B86-10094

TELEVISION MONITORING SYSTEM FOR WELDING

K. VALLOW (Rockwell International), and S. GORDON (Rockwell International)

Jun. 1986

MFS-29104

Vol. 10, No. 1, P. 138

Welding process in visually inaccessible spots viewed and recorded. Television system enables monitoring of welding in visually inaccessible locations. System assists welding operations and provide video record, used for weld analysis and welder training.

B86-10095

WRINKLE-FREE HYDROFORMING OF WIRE MESH

J. FADNESS (Rockwell International Corp.)

Jun. 1986

MFS-29111

Vol. 10, No. 1, P. 139

Plastic films lubricate workpiece so it deforms smoothly. Thin layers of plastic below top die and above bottom die ensure wire screen slides as shaped by hydroforming. Plastic layers are 0.0043 in. (0.11 m) thick. Preformed to contours of dies and final workpiece. New method of hydroforming fine-wire-mesh heat-shield screens eliminates wrinkles and marks. Prevents screen from being damaged and pores from becoming blocked.

B86-10183

ION-DEPOSITED POLISHED COATINGS

B. A. BANKS

Jun. 1986 See Also (N81-19278)

LEW-13545

Vol. 10, No. 2, P. 138

Polished, dense, adherent coatings relatively free of imperfections. New process consists of using broad-beam ion source in evacuated chamber to ion-clean rotating surface that allows grazing incidence of ion beam. This sputter cleans off absorbed gases, organic contaminants, and oxides of mirror surface. In addition to cleaning, surface protrusions sputter-etched away. Process particularly adaptable to polishing of various substrates for optical or esthetic purposes.

B86-10184

HEAT BONDING OF IRRADIATED ETHYLENE VINYL ACETATE

D. H. SLACK (ILC Dover)

Jun. 1986

MSC-20320

Vol. 10, No. 2, P. 139

Reliable method now available for joining parts of this difficult-to-bond material. Heating fixture encircles ethylene vinyl acetate multiplesocket part, providing heat to it and to tubes inserted in it. Fixtures specially designed to match parts to be bonded. Tube-and-socket bonds made with this technique subjected to tensile tests. Bond strengths of 50 percent that of base material obtained consistently.

B86-10185

THERMOPLASTIC COMPOSITES FOR RESEARCH-MODEL COMPONENTS

B. F. GUENTHER, and P. VASQUEZ

Jun. 1986

LAR-13348

Vol. 10, No. 2, P. 140

Oriented unidirectional prepreg tapes formed in ceramic molds. New technique developed at Langley Research Center, using ceramic mold for fabrication of models from graphite/thermoplastic materials. Upper surface of wings and fuselage of advanced airplane selected as shape to test fabrication technique. Technique well suited for other complex shapes as well. Thermoplastic composite easily workable with normal shop equipment and painted and repaired by standard methods.

B86-10186

CONTROLLING ARC LENGTH IN PLASMA WELDING

W. F. ICELAND (Rockwell International Corp.)

Jun. 1986

MSC-20900

Vol. 10, No. 2, P. 141

Circuit maintains arc length on irregularly shaped workpieces. Length of plasma arc continuously adjusted by control circuit to maintain commanded value. After pilot arc is established, contactor closed and transfers arc to workpiece. Control circuit then half-wave rectifies ac arc voltage to produce dc control signal proportional to arc length. Circuit added to plasma arc welding machines with few wiring changes. Welds made with circuit cleaner and require less rework than welds made without it. Beads smooth and free of inclusions.

B86-10187

OPTICAL MONITORING OF WELD PENETRATION

J. MARAM (Rockwell International Corp.)

Jun. 1986

MFS-29107

Vol. 10, No. 2, P. 142

Robotic welding controlled by reliable, relatively-noise-free optoelectronic unit. Bounding off meniscus of pool of molten metal, laser beam impinges on position-sensitive photodetector. Beam diameter adjusted for width of weld. Optical filters screen out light from arc. Made from small, low-cost components and utilizing optical fibers to conduct signals, system immune to electromagnetic interference common in industrial environments. Aimed for automatic welders, robot welders in particular and also adaptable to other types of welding, including tungsten/inert-gas, laser, and electron-beam techniques.

B86-10188

CRYSTAL-GROWING CRUCIBLE TO SUPPRESS CONVECTION

R. RICHTER (Caltech)

Jun. 1986

NPO-16597

Vol. 10, No. 2, P. 142

Platform under growth region stabilizes melt for more uniform crystal growth. In new crucible, platform just below growth interface so melt is too shallow to support convection. Critical depth for

onset of pertinent instability calculated from heat flux through surface of melt, volume coefficient of thermal expansion, thermal conductivity, thermal diffusivity, and kinematic viscosity.

B86-10189**VOID-FREE LID FOR FOOD PACKAGING**

C. D. WATSON (ESD Corp.), and W. P. FARRIS (ESD Corp.)
Jun. 1986

MSC-20661**Vol. 10, No. 2, P. 143**

Flexible cover eliminates air pockets in sealed container. Universal food-package lid formed from flexible plastic. Partially folded, lid unfolded by depressing center portion. Height of flat portion of lid above flange thereby reduced. Pressure of food against central oval depression pops it out, forming dome that provides finger grip for mixing contents with water or opening lid. Therefore food stays fresh, allows compact stacking of partially filled containers, and resists crushing. Originally developed for packaging dehydrated food for use in human consumption on Space Shuttle missions. Other uses include home canning and commercial food packaging.

B86-10190**METALIZING SOLAR CELLS BY SELECTIVE ELECTROPLATING**

S. DUTTA (Westinghouse Electric Corp.), and P. A. PALASCHAK (Westinghouse Electric Corp.)
Jun. 1986

NPO-16600**Vol. 10, No. 2, P. 144**

Contact patterns traced by laser scanning. Conductor paths deposited on silicon solar-cell wafers by laser irradiation followed by electroplating. Laser-assisted metalization technique offers better resolution and lower contact resistance than does conventional metalization by screen printing. At the same time, less expensive than metalization with masks and photolithography.

B86-10191**TRANSFER CASTING FROM ION-BEAM-TEXTURED SURFACES**

B. A. BANKS, A. J. WEIGAND, and J. S. SOVEY
Jun. 1986 See Also (N81-21129)

LEW-13120**Vol. 10, No. 2, P. 144**

Textured surfaces created on metals, ceramics, and polymers. Electron-bombardment ion thruster used as neutralized-ion-beam source. Beam of directed, energetic ions alter surface chemistry and/or morphology of many materials. By adjusting ion energy and ion-beam current density impinging upon target, precise surface modifications obtained without risk of target material melting or bulk decomposition. Technique developed to generate precise, controllable, surface microstructures on metals, ceramics, and polymers.

B86-10192**MAKING LATEX MICROSPHERES IN SPACE**

D. M. KORNFELD, J. W. VANDERHOFF (Lehigh University), M. S. EL-AASSER (Lehigh University), F. J. MICALÉ (Lehigh University), E. D. SUDOL (Lehigh University), C. M. TSENG (Lehigh University), and A. SILWANOWICZ (Lehigh University)
Jun. 1986

MFS-27085**Vol. 10, No. 2, P. 145**

Equipment yields larger, more uniform particles. Two NASA reports describe first commercial product to be manufactured in space. Product monodisperse latex, suspension of spherical particles of essentially same diameter. Carried aboard Space Shuttle on its orbital missions, monodisperse latex reactor (MLR) produces spheres of much larger size than possible on Earth. Microspheres 30 micrometers in diameter produced, whereas 5 micrometers is limit for Earthbound reactors. Microspheres as large as 100 micrometers scheduled for production in MLR.

B86-10289**THERMALLY-ACTIVATED METAL-TO-GLASS BONDING**

B. D. GALLAGHER (Caltech)
May 1986

NPO-16423**Vol. 10, No. 3, P. 128**

Hermetic seals formed easily by use of metallo-organic film. Metallo-organic film thermally bonded to glass and soldered or welded to form hermetic seal. Film applied as ink consisting of silver neodecanoate in xylene. Relative amounts of ingredients selected to obtain desired viscosity. Material applied by printing or even by scribing with pen. Sealing technique useful in making solar-cell modules, microelectronic packages, and other hermetic silicon devices.

B86-10290**ELECTROCHEMICAL PROCESS MAKES FINE NEEDLES**

J. L. WATKINS (Caltech)
May 1986

NPO-16311**Vol. 10, No. 3, P. 135**

Electrochemical process makes fine tungsten needles for use as microscopic probes or field-emission cathodes. Etching vessel filled with dense, inert lower liquid covered by less-dense, caustic etching solution. Newly formed needle breaks off upper part of wire in etchant and falls into can in inert liquid below. Improved process does not require close monitoring and left unattended for an indefinite time.

B86-10291**FILTERS FOR SUBMILLIMETER ELECTROMAGNETIC WAVES**

C. M. BERDAHL (Caltech)
May 1986

NPO-16498**Vol. 10, No. 3, P. 136**

New manufacturing process produces filters strong, yet have small, precise dimensions and smooth surface finish essential for dichroic filtering at submillimeter wavelengths. Many filters, each one essentially wafer containing fine metal grid made at same time. Stacked square wires plated, fused, and etched to form arrays of holes. Grid of nickel and tin held in brass ring. Wall thickness, thickness of filter (hole depth) and lateral hole dimensions all depend upon operating frequency and filter characteristics.

B86-10292**WELD REPAIR OF THIN ALUMINUM SHEET**

C. S. BEUYUKIAN (Rockwell International Corp.), and M. J. MITCHELL (Rockwell International Corp.)
May 1986

MSC-20902**Vol. 10, No. 3, P. 137**

Weld repairing of thin aluminum sheets now possible, using niobium shield and copper heat sinks. Refractory niobium shield protects aluminum adjacent to hole, while copper heat sinks help conduct heat away from repair site. Technique limits tungsten/inert-gas (TIG) welding bombardment zone to melt area, leaving surrounding areas around weld unaffected. Used successfully to repair aluminum cold plates on Space Shuttle. Commercial applications, especially in sealing fractures, dents, and holes in thin aluminum face sheets or clad brazing sheet in cold plates, heat exchangers, coolers, and Solar panels. While particularly suited to thin aluminum sheet, this process also used in thicker aluminum material to prevent surface damage near weld area.

B86-10293**REPAIRING HARD-TO-REACH CRACKS IN HEAT-EXCHANGER TUBES**

R. C. MILLS, SR. (Rockwell International Corp.), and J. DUESBERG (Rockwell International Corp.)
May 1986

MFS-29128**Vol. 10, No. 3, P. 138**

Inaccessible leaks repaired from accessible side of tube. Fish-Mouth insert placed in cut in leaky heat-exchanger tube. Insert welded or brazed to tube, and remaining open area of cut patched. Method developed for repairing leaks in nozzle coolant tubes of Space Shuttle main engine. Method also used on other types of tubular heat exchangers.

B86-10294**DEPOSITING DIAMONDLIKE CARBON FILMS**

M. J. MIRTICH, J. S. SOVEY, and B. A. BANKS

May 1986 See Also N84-31512/NSP

LEW-14080**Vol. 10, No. 3, P. 139**

New process demonstrated to make thin films (usually thousands of angstroms to few microns thick) that have properties of diamonds. Various plasma and ion-beam techniques employed to generate films. Films made by radio-frequency plasma decomposition of hydrocarbon gas or other alkanes, by low-energy carbon-ion-beam deposition, or by ion plating and dual ion technique using carbon target. Advantages of new process over others are films produced, though amorphous, are clear, extremely hard, chemically inert, of high resistivity, and have index of refraction of 3.2 properties similar to those of single-crystal diamonds. Films have possible uses in microelectronic applications, high-energy-laser and plastic windows, corrosion protection for metals, and other applications where desired properties of film shaped during the film-formation process.

B86-10295**MASKING TECHNIQUE FOR ION-BEAM SPUTTER ETCHING**

B. A. BANKS, and S. K. RUTLEDGE

May 1986 See Also N82-28445/NSP

LEW-13899**Vol. 10, No. 3, P. 140**

Improved process for fabrication of integrated circuits developed. Technique utilizes simultaneous ion-beam sputter etching and carbon sputter deposition in conjunction with carbon sputter mask or organic mask decomposed to produce carbon-rich sputter-mask surface. Sputter etching process replenishes sputter mask with carbon to prevent premature mask loss.

B86-10296**UNITIZED NUT-AND-WASHER ASSEMBLY**

P. J. ROSSI (Rockwell International Corp.)

May 1986

MSC-20903**Vol. 10, No. 3, P. 141**

Combination nut, washer, and lockwasher secures parts quickly without damaging metal finishes. Nut and lockwasher are captured by bent tabs of flat washer in this concept for unified fastener. Optional perforated tab on flat washer allows easy tagging and storage. Fastener intended for attaching leads and buses to studs on electronic equipment.

B86-10297**COMPOSITE FASTENERS**

G. S. NG

May 1986

LAR-13058**Vol. 10, No. 3, P. 142**

Flexible composite fasteners made of polyvinyl chloride or other resilient synthetic material designed for joining together various materials which may vary slightly in thickness during use. Fasteners easily installed and removed by hand and maintain approximately same tension in bonding materials together, regardless of subsequent movements of materials. Design and choice of material of new fasteners enables variety of uses, as book binders, hole sealers, insulating fasteners for electronic circuitry, or break-away energy-absorbing fasteners for vehicles in crashes.

B86-10298**ACOUSTIC TRANSLATION OF AN ACOUSTICALLY LEVITATED SAMPLE**

M. B. BARMATZ (Caltech), and J. L. ALLEN (Caltech)

May 1986

NPO-16675**Vol. 10, No. 3, P. 144**

Acoustic-levitation apparatus uses only one acoustic mode to move sample from one region of chamber to another. Sample heated and cooled quickly by translation between hot and cold regions of levitation chamber. Levitated sample is raised into furnace region by raising plunger. Frequency of sound produced by transducers adjusted by feedback system to maintain (102) resonant mode, which levitates sample midway between transducers and plunger regardless of plunger position.

B86-10299**ACOUSTIC LEVITATOR MAINTAINS RESONANCE**

M. B. BARMATZ (Caltech), and M. S. GASPAR (Caltech)

May 1986

NPO-16649**Vol. 10, No. 3, P. 145**

Transducer loading characteristics allow resonance tracked at high temperature. Acoustic-levitation chamber length automatically adjusted to maintain resonance at constant acoustic frequency as temperature changes. Developed for containerless processing of materials at high temperatures, system does not rely on microphones as resonance sensors, since microphones are difficult to fabricate for use at temperatures above 500 degrees C. Instead, system uses acoustic transducer itself as sensor.

B86-10300**XENON-ION DRILLING OF TUNGSTEN FILMS**

C. E. GARNER (Caltech)

May 1986

NPO-16626**Vol. 10, No. 3, P. 145**

High-velocity xenon ions used to drill holes of controlled size and distribution through tungsten layer that sheaths surface of controlled-porosity dispenser cathode of traveling wave-tube electron emitter. Controlled-porosity dispenser cathode employs barium/calcium/ aluminum oxide mixture that migrates through pores in cathode surface, thus coating it and reducing its work function. Rapid, precise drilling technique applied to films of other metals and used in other applications where micron-scale holes required. Method requires only few hours, as opposed to tens of hours by prior methods.

B86-10301**LASER CUTTING OF THIN NICKEL BELLOWS**

C. L. BUTLER (Rockwell International Corp.)

May 1986

MFS-29133**Vol. 10, No. 3, P. 146**

Laser cutting technique produces narrow, precise, fast, and repeatable cuts in thin nickel-alloy bellows material. Laser cutting operation uses intense focused beam to melt material and assisting gas to force melted material through part thickness, creating void. When part rotated or moved longitudinally, melting and material removal continuous and creates narrow, fast, precise, and repeatable cut. Technique used to produce cuts of specified depths less than material thickness. Avoids distortion, dents, and nicks produced in delicate materials during lathe trimming operations, which require high cutting-tool pressure and holding-fixture forces.

B86-10302**THEORETICAL FOUNDATION FOR WELD MODELING**

S. TRAUGOTT (Martin Marietta Corp.)

May 1986

MFS-27095**Vol. 10, No. 3, P. 147**

Differential equations describe physics of tungsten/inert-gas and plasma-arc welding in aluminum. Report collects and describes

necessary theoretical foundation upon which numerical welding model is constructed for tungsten/inert gas or plasma-arc welding in aluminum without keyhole. Governing partial differential equations for flow of heat, metal, and current given, together with boundary conditions relevant to welding process. Numerical estimates for relative importance of various phenomena and required properties of 2219 aluminum included

B86-10340

PROGRAM FOR HEAT FLOW IN WELDING

A. C. NUNES, JR., and M. GRAHAM

Jul. 1986

MFS-28081

Vol. 10, No. 4, P. 74

Program contains numerical model of temperature distribution in vicinity of weld. Weld model used to produce estimated welding power requirements, welding-power-loss analysis, heat-affected-zone temperature history, and weld-puddle cross-section plots. Applied to gas/tungsten-arc, plasma-arc, electron-beam, and laser-beam welds on wide plates under steady conditions. User predicts power requirements and temperature distributions. Weld model written in BASIC.

B86-10384

TELESCOPING SPACE-STATION MODULES

R. D. WITCOFSKI

Jul. 1986

LAR-13330

Vol. 10, No. 4, P. 112

New telescoping-space-station design involves module within a module. After being carried to orbit within payload bay of Space Shuttle orbiter, outer module telescopically deployed to achieve nearly twice as much usable space-station volume per Space Shuttle launch. Closed-loop or 'race-track' space-station configurations possible with this concept and provide additional benefits. One benefit involves making one of modules double-walled haven safe from debris, radiation, and like. Module accessible from either end, and readily available to all positions in space station. Concept also provides flexibility in methods in which Space Shuttle orbiter docked or berthed with space station and decrease chances of damage.

B86-10385

THERMAL-STRESS-FREE FASTENERS FOR ORTHOTROPIC MATERIALS

M. L. BLOSSER, R. R. MCWITHEY, and T. F. KEARNS (Institute for Defense Analyses)

Jul. 1986 See Also N84-13614/NSP

LAR-13325

Vol. 10, No. 4, P. 113

Theoretical basis for design of thermal-stress-free fasteners developed. Two-dimensional analysis defines shapes of interfaces between materials. Design technique determines fastener shapes that maintain tight thermal-stress-free joint while joint undergoes uniform temperature change.

B86-10386

MODULAR FIREWALLS FOR STORAGE AREAS

O. H. FEDOR, and L. J. OWENS

Jul. 1986

KSC-11276

Vol. 10, No. 4, P. 114

Giant honeycomb structures assembled in modular units. Flammable materials stored in cells. Walls insulated with firebrick to prevent spread of fire among cells. Portable, modular barrier withstands heat of combustion for limited time and confines combustion products horizontally to prevent fire from spreading. Barrier absorbs heat energy by ablation and not meant to be reused. Designed to keep fires from spreading among segments of solid rocket propellant in storage, barrier erected between storage units of other flammable or explosive materials; tanks of

petroleum or liquid natural gas. Barrier adequate for most industrial purposes.

B86-10387

FASTER EDGE-DEFINE SILICON-RIBBON GROWTH

R. RICHTER (Caltech)

Jul. 1986

NPO-16692

Vol. 10, No. 4, P. 115

End-cooling allows faster growth and yields single-crystal ribbons. Improvement in edge-defined film-fed process for growing silicon ribbons increases speed of growth and improves quality of silicon product. Also produces silicon sheets, webs, or boules. Cold shoes cool melt at ends of emerging sheet. Since solidification at ends now occurs before end menisci reach maximum height, ribbon drawn substantially faster.

B86-10388

LIGHTWEIGHT FORMS FOR EPOXY/ARAMID DUCTS

E. W. MIX (Rockwell International Corp.), A. N. ANDERSON (Rockwell International Corp.), and DONALD L. BEDFORD, SR. (Rockwell International Corp.)

Jul. 1986

MSC-20957

Vol. 10, No. 4, P. 116

Aluminum mandrels easy to remove. Lightweight aluminum mandrel for shaping epoxy/aramid ducts simplifies and speeds production. In new process, glass-reinforced epoxy/aramid cloth wrapped on aluminum mandrel. Stainless-steel flanges and other hardware fitted on duct and held by simple tooling. Entire assembly placed in oven to cure epoxy. After curing, assembly placed in alkaline bath dissolves aluminum mandrel in about 4 hours. Epoxy/aramid shell ready for use as duct. Aluminum mandrel used to make ducts of various inside diameters up to 6 in. Standard aluminum forms used. Conventional tube-bending equipment produces requisite curves in mandrels.

B86-10389

LOW-FLAMMABILITY PTFE FOR HIGH-OXYGEN ENVIRONMENTS

E. WALLE (Martin Marietta Corp.), B. FALLON (Martin Marietta Corp.), and A. SHEPPARD (Martin Marietta Corp.)

Jul. 1986

MFS-28127

Vol. 10, No. 4, P. 117

Modified forming process removes volatile combustible materials. Flammability of cable-wrapping tape reduced by altering tape-manufacturing process. In new manufacturing process, tape formed by proprietary process of screw extrusion, followed by washing in solvent and drying. Tape then wrapped as before. Spectrogram taken after extrusion, washing, and drying shows lower hydrocarbon content. PTFE formed by new process suited to oxygen-rich environments. Safe in liquid oxygen of Space Shuttle tank and in medical uses; thin-wall shrinkable tubing in hospital test equipment, surgical instruments, and implants.

B86-10390

JOINT FOR RAPID STRUCTURAL ASSEMBLY

M. D. RHODES

Jul. 1986

LAR-13489

Vol. 10, No. 4, P. 117

Quickly attaching joint used in variety of truss structures. Split ring made in one piece and split radially after final machining. Mating tapers on split ring and endbells small: approximately 7 degrees. Tapers of this range permit high internal preloads to be obtained, yet parts easily separated when collar released. Results from tests on developmental model indicate load-displacement response linear and substantial preloading accomplished. Quickly-erecting truss structures have variety of applications, from Earth to space-station keel beams, antenna masts, and large platforms.

B86-10391
WELDING AND BRAZING SILICON CARBIDE

T. J. MOORE

Jul. 1986

LEW-14251

Vol. 10, No. 4, P. 118

Hot isostatic pressing and conventional furnace brazing effective under right conditions. Study performed showed feasibility of welding SiC using several welding and brazing techniques. Use of SiC improves engine efficiency by allowing increase in operating temperature. SiC successfully hot-pressure-welded at 3,550 degrees F (1,950 degrees C) in argon. Refinements of solid-state welding and brazing procedures used sufficient for some specific industrial applications.

B86-10392
MAKING A LIGHTWEIGHT BATTERY PLAQUE

M. A. REID, R. E. POST, and D. SOLTIS

Jul. 1986 See Also N84-32357/NSP

LEW-13349

Vol. 10, No. 4, P. 119

Plaque formed in porous plastic by electroless plating. Lightweight plaque prepared by electroless plating of porous plastic contains embedded wire or expanded metal grid. Plastic may or may not be filled with soluble pore former. If it contains soluble pore former, treated to remove soluble pore former and increase porosity. Porous plastic then clamped into rig that allows plating solutions to flow through plastic. Lightweight nickel plaque used as electrode substrate for alkaline batteries, chiefly Ni and Cd electrodes, and for use as electrolyte-reservoir plates for fuel cells.

B86-10393
PRESSURE RIG FOR REPETITIVE CASTING

P. VASQUEZ, and W. R. HUTTO

Jul. 1986

LAR-13485

Vol. 10, No. 4, P. 120

Equipment life increased by improved insulation. New design cuts time of preparation for casting from several days to about 1 hour. Savings due to elimination of lengthy heating and drying operations associated with preparation of ceramic mold. Quality of casting improved because moisture in cavity eliminated by use of insulating material, and more uniform pressure applied to process. Commercial blanket insulator protects components from heat, increasing life of pressure rig and enabling repeated use. Improved heat protection allows casting of brass and other alloys with higher melting temperatures in pressure rig.

B86-10394
AUTOMATIC-CONTROL SYSTEM FOR SAFER BRAZING

J. A. STEIN (Rockwell International Corp.), and M. A. VANASSE (Rockwell International Corp.)

Jul. 1986

MSC-20881

Vol. 10, No. 4, P. 121

Automatic-control system for radio-frequency (RF) induction brazing of metal tubing reduces probability of operator errors, increases safety, and ensures high-quality brazed joints. Unit combines functions of gas control and electric-power control. Minimizes unnecessary flow of argon gas into work area and prevents electrical shocks from RF terminals. Controller will not allow power to flow from RF generator to brazing head unless work has been firmly attached to head and has actuated micro-switch. Potential shock hazard eliminated. Flow of argon for purging and cooling must be turned on and adjusted before brazing power applied. Provision ensures power not applied prematurely, causing damaged work or poor-quality joints. Controller automatically turns off argon flow at conclusion of brazing so potentially suffocating gas does not accumulate in confined areas.

B86-10395
COATING CIRCUIT BOARDS WITH SILICONE

S. GAUDIANO

Jul. 1986

MSC-21020

Vol. 10, No. 4, P. 121

Techniques appropriate to boards containing CMOS circuits detailed. Document presents procedure for applying thin conformal coating to such electronic assemblies as printed-circuit boards and wire-wrapped boards. Coating is from 1 to 7 mils (25 to 178 micrometers) thick and composed of room-temperature-vulcanizing (RTV) silicone. Specifies materials, equipment, spraying method, and quality requirements. Takes into account special needs of circuits made with complementary metal-oxide/semiconductor (CMOS) devices on circuit boards. Special attention given to preventing damage by electrostatic discharge, to which CMOS circuits especially sensitive.

B86-10396
INVESTING IN A LARGE STRETCH PRESS

M. CHOATE (Boeing Aerospace Co.), W. NEALSON (Boeing Aerospace Co.), G. JAY (Boeing Aerospace Co.), and W. BUSS (Boeing Aerospace Co.)

Jul. 1986

MFS-27126

Vol. 10, No. 4, P. 122

Press for forming large aluminum parts from plates provides substantial economies. Study assessed advantages and disadvantages of investing in large stretch-forming press, and also developed procurement specification for press.

B86-10397
EXPLOITING THE VACUUM OF SPACE

R. J. NAUMANN

Jul. 1986

MFS-28139

Vol. 10, No. 4, P. 122

Molecular-beam epitaxy and other processes tested with minimal contamination. Vacuum experimental facility for outer space creates vacuums higher than those available in terrestrial vacuum chambers. Facility minimizes contamination of work from walls and allows rapid removal of gases and heat generated by experimental processes. Used for processes such as molecular-beam epitaxy (growing semiconductor superlattices), metal/organic chemical vapor deposition, coating mirrors and other optical components, and ultrapurification.

B86-10398
PHYSICS OF FUSION WELDING

A. C. NUNES, JR.

Jul. 1986 See Also N86-11473/NSP

MFS-27138

Vol. 10, No. 4, P. 123

Applicabilities and limitations of three techniques analyzed. NASA technical memorandum discusses physics of electron-beam, gas/tungsten-arc, and laser-beam welding. From comparison of capabilities and limitations of each technique with regard to various welding conditions and materials, possible to develop criteria for selecting best welding technique in specific application. All three techniques classified as fusion welding; small volume of workpiece melted by intense heat source. Heat source moved along seam, leaving in wake solid metal that joins seam edges together.

B86-10399
PROPERTIES OF VPPA-WELDED 2219-T87 ALUMINUM

W. WILSON, and W. A. JEMIAN (Auburn University)

Jul. 1986

MFS-27105

Vol. 10, No. 4, P. 123

Metallurgical properties and effects of welding described. Report describes investigation of welding of 2219-T87 aluminum alloy by variable-polarity plasma-arc (VPPA) process. Research was to determine highest strength attainable with this alloy and process and to estimate changes in weld properties caused by variations of process controls. Alloy 2219 strong and heat treatable and

retains structural integrity up to 600 degrees F (316 degrees C). Its principal structural alloy of Space Shuttle external tank. VPPA process offers many advantages and replaces tungsten/inert-gas process used. In over 24,000 in. (610 m) of welds on tank, there has been no internal defect requiring manual repair.

B86-10400**DEPLOYABLE CONSTRUCTION PLATFORM**

R. M. GATES (Boeing Aerospace Co.), and K. P. HERNLEY (Boeing Aerospace Co.)

Jul. 1986

MFS-28117

Vol. 10, No. 4, P. 124

Structure folds compactly for transportation but opens into large work and storage area. Platform central location for building structures, storing equipment and parts, and servicing and checking out space vehicles. Provides electrical power, lighting, and tools. Developed for use on space station, includes folding structural parts adaptable to portable or field-assembled terrestrial structures.

B86-10471**MAKING HIGHLY PURE GLASS RODS**

R. J. NAUMANN

Sep. 1986

MFS-28090

Vol. 10, No. 5, P. 118

Proposed quasi-containerless method for making glass rods or fibers minimizes contact between processing equipment and product. Method allows greater range of product sizes and shapes than achieved in experiments on containerless processing. Molten zone established in polycrystalline rod. Furnace sections separated, and glass rod solidifies between them. Clamp supports solid glass as it grows in length. Pulling clamp rapidly away from melt draws glass fiber. Fiber diameter controlled by adjustment of pulling rate.

B86-10472**IMPROVED JOINT DESIGN FOR BOX-STIFFENED PANELS**

R. C. DAVIS, and P. L. MOSES (PRC Kentron, Inc.)

Sep. 1986 See Also N85-33537/NSP

LAR-13460

Vol. 10, No. 5, P. 119

Mass and strength analyses and system requirements identified titanium-box-stiffened-skin wall candidate for lightweight fuselage of pressurized vehicle. Photoelastic models of stiffener-to-skin joint used to identify quickly modifications to joint that lowers severity of stress concentration. Results with various photoelastic models cut from polyurethane sheet led to novel diffusion-bond joint with reduced stress concentration.

B86-10473**SMOOTHER SCRIBING OF SILICON WAFERS**

S. DANYLUK (University of Illinois for Caltech)

Sep. 1986

NPO-16568

Vol. 10, No. 5, P. 120

Proposed new tool used to scribe silicon wafers into chips more smoothly than before. New scriber produces surface that appears ductile. Scribed groove cuts have relatively smooth walls. Scriber consists of diamond pyramid point on rigid shaft. Ethanol flows through shaft and around point, like ink in ballpoint pen. Ethanol has significantly different effect for scribing silicon than water, used in conventional diamond scribes.

B86-10474**ROBOTIC VISION FOR WELDING**

R. W. RICHARDSON (Ohio State University Research Foundation)

Sep. 1986

MFS-27119

Vol. 10, No. 5, P. 121

Vision system for robotic welder looks at weld along axis of welding electrode. Gives robot view of most of weld area, including

yet-unwelded joint, weld pool, and completed weld bead. Protected within welding-torch body, lens and fiber bundle give robot closeup view of weld in progress. Relayed to video camera on robot manipulator frame, weld image provides data for automatic control of robot motion and welding parameters.

B86-10475**FLEXIBLE DIAPHRAGM WITHSTANDS EXTREME TEMPERATURES**

G. LERMA (Rockwell International Corp.)

Sep. 1986

MSC-20797

Vol. 10, No. 5, P. 122

Diaphragm seal retains flexibility throughout temperature range of -200 to +600 degree F (-129 to +316 degree C). Diaphragm durable, simple, versatile, and relatively inexpensive to manufacture. Suitable for refrigeration seals, autoclaves, storage lockers, and other sealing applications subjected to extreme temperature differentials.

B86-10476**REPAIRING FOAM INSULATION**

J. CORBIN (Martin Marietta Corp.), and D. BURAS (Martin Marietta Corp.)

Sep. 1986

MFS-28109

Vol. 10, No. 5, P. 123

Large holes in polyurethane foam insulation repaired reliably by simple method. Little skill needed to apply method, used for overhead repairs as well as for those in other orientations. Plug positioned in hole to be filled and held in place with mounting fixture. Fresh liquid foam injected through plug to bond it in place. As foam cures and expands, it displaces plug outward. Protrusion later removed.

B86-10477**LIQUID-DOPANT FABRICATION OF SOLAR CELLS**

PAUL ALEXANDER, JR. (Caltech), and R. B. CAMPBELL (Westinghouse Corp.)

Sep. 1986

NPO-16652

Vol. 10, No. 5, P. 124

Liquid dopants and liquid masks used to produce front and back junctions of solar cells. Resulting cells equal in efficiency to those fabricated by more-expensive gaseous-diffusion technique.

B86-10478**DEVELOPMENT OF GRAPHITE/EPOXY CORNER FITTINGS**

G. FAILE, R. HOLLIS, F. LEDBETTER, J. MALDONADO, J. SLEDD, J. STUCKEY, G. WAGGONER, and E. ENGLER

Sep. 1986 See Also N85-32147/NSP

MFS-27129

Vol. 10, No. 5, P. 124

Report documents development project aimed at improving design and load-carrying ability of complicated corner fitting for optical bench. New fitting made of graphite filaments in epoxy-resin matrix. Composite material selected as replacement for titanium because lighter and dimensions change little with temperature variations.

B86-10517**LIGHTWEIGHT, NESTING STRUTS**

R. M. GATES (The Boeing Co.), and K. P. HERNLEY (The Boeing Co.)

Nov. 1986

MFS-28116

Vol. 10, No. 6, P. 82

Hollow cones easily assembled to form trusses. Struts made of graphite-fiber-reinforced epoxy resin tapered for stiffness and compact nesting for transportation. Developed for building large truss structures in space. Useful on Earth in small structures where great strength not required.

08 FABRICATION TECHNOLOGY

B86-10518

PRODUCING REFRACTORY MICROBALLOONS

M. C. LEE (Caltech), C. SCHILLING (Caltech), GEORGE O. LADNER, JR. (Caltech), and T. WANG (Caltech)
Nov. 1986

NPO-16489

Vol. 10, No. 6, P. 83

Metals, ceramics, and glasses just some of possible raw materials. Key components of equipment for new microballoon fabrication process nozzle, crucible assembly, and drop tube. Recessed, conical inner orifice aids in producing uniform, symmetrical microballoons. All-graphite crucible assembly resistant to misalignment and cracks. Drop tube ensures timely solidification of microballoons used in fluidized-bed heat exchangers; as containers for hazardous materials; catalysts in chemical and pharmaceutical processes; solid fuel for rockets; fuel containers for fusion power experiments; shock-wave dampers; and starting materials for high-strength, low-density sintered alloys and ceramics.

B86-10519

LASER VACUUM FURNACE FOR ZONE REFINING

D. B. GRINER (Penn-Penn Research Corp.), F. W. ZURBURG (Penn-Penn Research Corp.), and W. M. PENN (Penn-Penn Research Corp.)
Nov. 1986

MFS-26043

Vol. 10, No. 6, P. 84

Laser beam scanned to produce moving melt zone. Experimental laser vacuum furnace scans crystalline wafer with high-power CO₂-laser beam to generate precise melt zone with precise control of temperature gradients around zone. Intended for zone refining of silicon or other semiconductors in low gravity, apparatus used in normal gravity.

B86-10520

STORING CHEMICALS IN PACKED SPHERES

T. G. WANG (Caltech), and D. D. ELLEMAN (Caltech)
Nov. 1986

NPO-16316

Vol. 10, No. 6, P. 85

Reactants released by crushing or puncturing. Agglomerated gas-filled spheres hexagonally close packed and sintered or glued together into rods strung together at ends. Rods fed into crushing machine to release material in spheres as needed.

B86-10521

MULTIFUNCTION VACUUM CHAMBER FOR IC METALLIZATION

D. E. ROUTH, and G. SHARMA
Nov. 1986 See Also U.S. Patent No. 4,437,961

MFS-25670

Vol. 10, No. 6, P. 86

Vacuum system chamber processing multilayer metallization on integrated circuits (IC's) performs four operations ordinarily done in separated equipment. Chamber etches holes, removes photoresist, cleans by sputter etching, and deposits final layer of metal. Combined-function chamber costs less than separate equipment. Chamber avoids exposing integrated circuits to room air and, to oxidation and dust, between steps. Eliminates time spent in transferring circuits from one apparatus to next.

B86-10522

COVERING CAVITIES BY ELECTRODEPOSITION

M. SCHMEETS (Rockwell International Corp.), and J. DUESBERG (Rockwell International Corp.)
Nov. 1986

MFS-29084

Vol. 10, No. 6, P. 87

Reworking technique allows complex surfaces to be reshaped. Contours of large machined parts reworked quickly and inexpensively by electrodeposition and machining, with little risk

of damage. Reworking method employs simple, reliable, well-known procedures.

B86-10523

LEVITATION WITH A SINGLE ACOUSTIC DRIVER

M. B. BARMATZ (Caltech), M. S. GASPAR (Caltech), and J. L. ALLEN (Caltech)
Nov. 1986

NPO-16246/NPO-16376

Vol. 10, No. 6, P. 89

Pair of reports describes acoustic-levitation systems in which only one acoustic resonance mode excited, and only one driver needed. Systems employ levitation chambers of rectangular and cylindrical geometries. Reports first describe single mode concept and indicate which modes used to levitate sample without rotation. Reports then describe systems in which controlled rotation of sample introduced.

B87-10040

SIMPLIFIED EXPLOSIVE JOINING OF TUBES TO FITTINGS

L. J. BEMENT, J. W. BAILEY (Kentron International, Inc.), R. PERRY (Kentron International, Inc.), and M. S. FINCH (Kentron International, Inc.)
Jan. 1987

LAR-13309

Vol. 11, No. 1, P. 88

Technique simplifies tube-to-fitting joining, as compared to fusion welding, and provides improvement on standard procedures used to join tubes explosively to tube fittings. Special tool inserted into tube to be joined. Tool allows strip of ribbon explosive to be placed right at joint. Ribbon explosive and mild detonating fuse allows use of smaller charge. Assembled tool storable, and process amenable to automation. Assembly of components, insertion of tool into weld site, and joining operation mechanized without human contact. Used to assemble components in nuclear reactors or in other environments hostile to humans.

B87-10041

CLEANER VACUUM-BAG CURING

J. M. CLEMONS, B. G. PENN, FRANK E. LEDBETTER, III, and J. G. DANIELS
Jan. 1987

MFS-28071

Vol. 11, No. 1, P. 69

Improvement upon recommended procedures saves time and expense. Autoclave molding in vacuum bag cleaner if adhesive-backed covering placed around caul plate as well as on mold plate. Covering easy to remove after curing and leaves caul plate free of resin deposits.

B87-10042

MOBILE PLATFORM FOR LARGE STRUCTURES

C. J. WESSELSKI, and W. C. SCHNEIDER
Jan. 1987

MSC-20985

Vol. 11, No. 1, P. 70

Proposed platform moves forward and in reverse, turns left and right, and changes planes. Mobile-platform concept proposed to move remote manipulators, workers, or other loads over truss panels on large structures. Platform moves at constant speed so does not cause swinging motion in hanging loads and overstress remote-manipulator arms. Transferred around corners to adjacent panels. Platform rides on sprocketed guide pins extending from structure at truss joints. Set of orthogonal tracks under platform slides on pins, which have enlarged heads to interlock with tracks. At least three tracks engage at least three pins at any position on panel so platform adequately and stably supported.

B87-10043

PREVENTING CRACKS IN SILICON-REACTOR LINERS

R. LUTWACK (Caltech)
Jan. 1987

NPO-16708**Vol. 11, No. 1, P. 71**

Correct placement helps prevent contamination while eliminating crack-causing deposits. Repositioning quartz liner in silicon fluidized-bed reactor prevents cracking of liner when cools. Liner protects stainless-steel walls of reactor from abrasion by particles in fluidized bed. Prevents contamination of newly formed silicon by material abraded from wall and ensures high-quality product.

B87-10044**REINFORCED MASKS FOR ION PLATING OF SOLAR CELLS**

W. R. CONLEY (Illinois Tool Works, Inc.), E. G. SWICK (Illinois Tool Works, Inc.), and J. C. VOLKERS (Illinois Tool Works, Inc.)
Jan. 1987

NPO-16417**Vol. 11, No. 1, P. 72**

Proposed mask for ion plating of surface electrodes on silicon solar cells reinforced to hold shape better during handling. Fabrication process for improved mask similar to conventional mask. Additional cuts and bends made in wide diametral strip to form bridges between pairs of mask fingers facing each other across this strip. Bridges high enough not to act as masks so entire strip area plated.

B87-10045**FAST-RESPONSE HEATING OF SILICON MELTS**

A. D. MORRISON (Caltech)
Jan. 1987

NPO-16730**Vol. 11, No. 1, P. 73**

Proposed improvement for silicon crystal growing enables rapid heating of melt in vicinity of liquid-solid interface to compensate for decreases in melt temperature, to ensure uniform diameter and composition in ingot. Intended for growing large silicon ingots by Czochralski process, cylindrical single-crystal ingot pulled from molten silicon. Heating confined to small mass near growing crystal.

B87-10095**QUICK-CHANGE ANODE FOR PLATING**

J. L. BEASLEY (Rockwell International Corp.)
Feb. 1987

MFS-19820**Vol. 11, No. 2, P. 72**

Proposed fastener for attaching electroplating anode improves quality of plating and increases productivity. Notches in twist-lock fastener mates with projections on end of anode bar. Fastener made of titanium for compatibility with copper-plating solution. Also constructed in snap-on, snap-off configuration.

B87-10096**IMPROVED STUD DESIGNS FOR WOOD/METAL JOINTS**

J. R. FADDIOL, M. ZUTECK (Gougeon Brother, Inc.), and G. SKAPER (IIT Research Institute)
Feb. 1987 See Also N86-10582/NSP

LEW-14365**Vol. 11, No. 2, P. 72**

Load-transfer capacities and resistances to fatigue increased. Series of high-strength bonded-stud designs developed for joining laminated wood to metal. Test results for bonded-stud designs demonstrated joint strengths approaching 10,000 to 12,000 psi (69 to 83 MPa) in ultimate strength and 5,000 psi (34 MPa) in high cycle fatigue strength of wood/epoxy composite achieved.

B87-10097**PREVENTING OXIDATION NEAR GAS/TUNGSTEN-ARC WELDS**

K. J. REED (Rockwell International Corp.)
Feb. 1987

MFS-29162**Vol. 11, No. 2, P. 73**

Auxiliary argon jets create more nearly complete nonoxidizing atmosphere. Pyramid-shaped cup directs stream of additional argon

over weld. Gas supplements provided by automatic welding machine so oxidation more completely suppressed.

B87-10098**SURGICAL BORESCOPIES REMOVE CONTAMINANTS**

K. VALLOW (Rockwell International Corp.)
Feb. 1987

MFS-29156**Vol. 11, No. 2, P. 73**

Borescope instruments put to use in extracting hard-to-reach particles. Surgical instruments in flexible borescopes used for removing contaminant particles from normally inaccessible places within equipment. Instruments readily enter small openings, turn corners, and reach far.

B87-10099**SPRING-LOADED INSCRIBING TOOL**

J. P. JOHNSON
Feb. 1987

MFS-28104**Vol. 11, No. 2, P. 74**

Spring-loaded, roller-type inscribing tool marks flat or nearly flat panels. Tool devised to apply grid lines to gore panels: panels then stress-tested by forming or stretching, followed by measurement of grid-system movement to determine distortion.

B87-10100**WET WINDING IMPROVES COIL ENCAPSULATION**

A. J. HILL (Rockwell International Corp.)
Feb. 1987

MFS-29174**Vol. 11, No. 2, P. 74**

Wet-winding process encapsulates electrical coils more uniformly than conventional processes. Process requires no vacuum pump and adapts easily to existing winding machines. Encapsulant applied to each layer of wire as soon as added to coil. Wet-winding process eliminates voids, giving more uniformly encapsulated coil.

B87-10101**MAKING FILLETS BY ELECTRICAL-DISCHARGE MACHINING**

R. BURLEY (Rockwell International Corp.)
Feb. 1987

MFS-19929**Vol. 11, No. 2, P. 75**

Shaped graphite electrode eliminates many hours of hand work. Hardened-steel forming tool transfers fillet shape to internal lip of electrode. Lip shape transferred to base of post in EDM procedure to form fillet. Array of electrodes produces many fillets simultaneously.

B87-10149**OPTICAL WELDING TORCH**

R. W. RICHARDSON (Ohio State University)
Mar. 1987

MFS-26034**Vol. 11, No. 3, P. 68**

Gas/tungsten-arc welding torch supports electrode at center while enabling viewing of weld area along torch axis. Gas torch accommodates lens and optical fibers, all part of vision system for welding robot. Welding torch includes spoked structure in central bore of optical body. Structure supports welding electrode, carries electric current to it, and takes heat away from it. Spokes formed by drilling six holes 60 degrees apart around center line of torch.

B87-10150**ELASTIC HINGE FOR SOLAR-CELL ARRAY**

R. M. MILLS (Lockheed Missiles and Space Co., Inc.)
Mar. 1987

MFS-28133**Vol. 11, No. 3, P. 69**

Elastic hinge folds to small thickness, allows easy replacement

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of panels attached, and provides part of torque for refolding without additional springs. Holds modules of solar-cell array. Modules kept in open position by external restraint. When restraint removed, elasticity of molybdenum hinge elements helps to fold facing modules together. Hinge developed for foldable modules for solar-cell panels.

B87-10151

MOLDED CONCRETE CENTER MINE WALL

E. V. LEWIS (Caltech)

Mar. 1987

NPO-16195

Vol. 11, No. 3, P. 70

Proposed semiautomatic system forms concrete-foam wall along middle of coal-mine passage. Wall helps support roof and divides passage into two conduits needed for ventilation of coal face. Mobile mold and concrete-foam generator form sections of wall in place.

B87-10152

PULTRUSION FABRICATION OF LONG BOOM MODELS

M. L. WILSON, and R. MISERENTINO

Mar. 1987

LAR-13441

Vol. 11, No. 3, P. 70

Composite materials of quasi-isotropic strength obtained. Fiberreinforced polymer matrix material produced by pulling fibers through polymer resin system and then through preforming dies and heated curing die. Experiments with pultrusion conducted in advanced composites technology with applications to aeronautical and space structures.

B87-10153

MAKING CERAMIC PARTS BY LAMINATING AND SINTERING THIN SHEETS

J. D. CAWLEY (Ohio State University)

Mar. 1987 See Also N85-32333/NSP

LEW-14361

Vol. 11, No. 3, P. 71

Chemical composition varies as function of depth. Technique developed to fabricate monolithic ceramic component by sintering laminated body made from thin sheets of green ceramic. Method allows discrete changes in chemistry effected across monolith. Component having one-dimensional variation in material composition fabricated in this manner.

B87-10154

DEEP, PRECISE ETCHING IN SEMICONDUCTORS

P. J. SHLICHTA (Caltech), and P. W. BARTH (Stanford University)

Mar. 1987

NPO-16562

Vol. 11, No. 3, P. 72

Semiconductors made to accept precise etching after pretreatment. Combination of material destabilization and anisotropic etching permits formation of precise perpendicular-wall cavities in silicon wafers and other semiconductors. New technique extends capabilities of current micromachining technology to fabrication of submillimeter waveguide arrays and filters. Pre-etching process currently used to fabricate thin-walled arrays of submillimeter waveguides for use as dichroic bandpass filters. Possible applications include integration of sensor probes and processing of circuitry on same silicon chip.

B87-10205

SOLDERING TOOL FOR INTEGRATED CIRCUITS

TED H. TAKAHASHI (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16838

Vol. 11, No. 4, P. 72

Many connections soldered simultaneously in confined spaces. Improved soldering tool bonds integrated circuits onto printed-circuit boards. Intended especially for use with so-called 'leadless-carrier' integrated circuits.

B87-10206

COMPOSITE-METAL-MATRIX ARC-SPRAY PROCESS

LEONARD J. WESTFALL

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-13828

Vol. 11, No. 4, P. 72

Arc-spray 'monotape' process automated, low in cost, and produces at high rate. Ideal for development of new metal-matrix composites. 'Monotape' reproducible and of high quality. Process carried out in controlled gas environment with programmable matrix-deposition rates, resulting in significant cost saving

B87-10207

INCREASING FATIGUE LIVES OF LASER-CUT PARTS

EDWARD W. GLICK (Rockwell International Corp.), and MICHAEL H. DONOVAN (Rockwell International Corp.)

Apr. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

MFS-29116

Vol. 11, No. 4, P. 74

Cut edges sanded to restore strength. Simple abrasion process removes transverse striations resulting from laser cutting of inconel 718 or equivalent alloy, increasing fatigue strengths of parts cut by laser beams. For stresses in range of 80 to 130 ksi (550 to 900 MPa) high cycle fatigue strengths restored to levels comparable to conventionally machined parts.

B87-10208

MAKING LINKED, WOUND-FILAMENT BANDS

ROBERT M. BAMFORD (Caltech), and JAMES B. STEPHENS (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16822

Vol. 11, No. 4, P. 74

Chains produced by use of rotating mandrel. Mandrel and locating and driving disks assembled around first band. Mandrel and band then mounted in respective positions on filament-winding machine. Second band linked to first by winding filament around first band on rotating mandrel. Short chains made this way have variety of uses; example, thermal isolators, each consisting of two linked bands of insulating material, used to support two separated insulating shields surrounding container of liquid helium.

B87-10209

VARIABLE-DIAMETER NOZZLE

TAYLOR G. WANG (Caltech)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15623

Vol. 11, No. 94, P. 76

Proposed device shapes and seals filled shells. Radial piezoelectric elements arranged like overlapping spokes on wheel contract to open hub and allow filled shell to emerge through. Stack of synchronized piezoelectric valves separated by spacers shape emerging pellet. Shells ranging in diameter from 2 millimeters to few centimeters produced.

B87-10246

ENSURING FULLY SOLDERED THROUGH HOLES

RAYMOND K. BLOW (Rockwell International Corp.)

May 1987 No additional information available: For specific technical

questions contact TU Officer at Center of origin

MFS-29120

Vol. 11, No. 5, P. 68

Simple differential-pressure soldering method provides visual evidence that hidden joints are fully soldered. Intended for soldering connector pins in plated through holes in circuit boards. Molten solder flows into plated through holes, drawn by vacuum in manifold over circuit board. Differential-pressure process ensures solder wets entire through hole around connector pin.

B87-10247

COMPOSITE PISTON-CAP STRUCTURE

ALLAN TAYLOR

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

LAR-13435

Vol. 11, No. 5, P. 69

Design eliminates thermal stress between composite cap and metal piston. New, conically surfaced, composite piston-cap structure, passively retained in metallic piston, made from carbon/carbon material, machined to shape. Shape includes conical faces, conical extensions intersect at common vertex on cylindrical axis of piston body, allowing thermal-stress-free retention of cap at all temperatures. When assembly heated or cooled, metal expands or contracts radially from coincident vertex. Where metal makes contact with carbon/carbon cap, snugly fitting conical faces slide without interference. Since metal body free to expand, no thermal stress produced in metal body or carbon/carbon cap.

B87-10248

LAPPING AND POLISHING AN ELLIPTICAL BORE

JOHN J. LOGGAN, JR., and SCOTT D. MEYER

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

LEW-14149

Vol. 11, No. 5, P. 70

Numerically controlled milling machine modified to make head reciprocate. Modification accomplished by removal of original milling head from machine and by mounting vertical slide in its place. Vertical slide driven up and down by connecting rod bolted off-center to drive pulley. Pulley driven by belt from variable-speed electric motor. Milling-machine head then attached to vertical slide. Mechanism allowed independent control of reciprocating surface speed through variation of speed of electric motor.

B87-10249

APPLICATION OF POWDERED RESIN FOR FOAM INSULATION

GLENN R. MORRIS (General Dynamics Corp.)

May 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin

LEW-14147

Vol. 11, No. 5, P. 71

Process developed to apply necessary insulation to valves, fittings, lines, etc. on such space vehicles as Centaur rocket stage. In new process, electrostatic equipment used to apply powdered polyimide resin directly to part to be insulated.

B87-10250

BONDED-PLATE AIRFOIL CONSTRUCTION

PIERCE L. LAWING

May 1987 Additional information available through: NTIS, Springfield, VA 22161 (TEI: 703-487-4650) (N85-23804/NSP and N86-16234/NSP)

LAR-13526

Vol. 11, No. 5, P. 71

Airfoil design for testing in 0.3-m Transonic Cryogenic Tunnel was symmetrical supercritical shape, consistent with flat-bond-plane bonding-and-channeling technology that had been developed. Technique offers greatly increased flexibility in orifice and pressure-channel layout.

B87-10251

PORTABLE SLOT-SIZING TOOL

NELSON T. ZUVER (Rockwell International Corp.)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21088

Vol. 11, No. 5, P. 72

Portable milling tool consisting of air-motor-driven cutter held in adjustable moving slide made possible local removal of chromium plating in close-tolerance, onsite remachining and sizing of half-hole slots on longeron bridges. Made from commercially available parts, including air motor capable of variable speeds up to 900 rpm, ball end mill, revolving handle, two miter gears, and ball slide. Adaptation of portable sizing tool useful for field modification of such large equipment as trucks, aircraft, and ships.

B87-10252

METAL-CLAD GRAPHITE/EPOXY TUBES

HAROLD G. BUSH, RAYMOND M. BLUCK (Lockheed Missiles and Space Company), and ROBERT R. JOHNSON (Lockheed Missiles and Space Company)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13562

Vol. 11, No. 5, P. 73

Structural parts feature low weight, low thermal expansion, and high stiffness. Unique, non-labor-intensive manufacturing process developed for fabricating aluminum-clad graphite/epoxy (Gr/E) struts which meet Space Station requirements. Method of manufacturing struts provides procedure for using Gr/E material system in very efficient manner. Technique places all fibers in longitudinal direction for stiffness and strength. Aluminum surfaces provide transverse strength and resistance to atomic oxygen in environment.

B87-10253

BACKLASH-FREE LOCKING HINGE

CLARENCE J. WESSEKSKI

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21056

Vol. 11, No. 5, P. 74

Tight joints achieved without precisely machined parts. Hinge for foldable structures locked with minimum force by human operator. Once locked, hinge makes strong, tight joint. Loose fit, or joint slop, common to commercial locking hinges eliminated. Despite tight fit, new hinge concept does not impose close tolerances on manufacture of its parts. Developed for erecting unfoldable structures in space, hinge used on collapsible scaffolds and similar terrestrial structures.

B87-10254

DRILLING HOLES IN GRAPHITE/EPOXY

RONALD MINLIONICA (Grumman Aerospace Corp.)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21120

Vol. 11, No. 5, P. 76

Relatively long-lived bit produces high-quality holes. Effective combination of cutting-tool design, feed, and speed determined for drilling 3/16-and-1/4-in. (0.48-and 0.65-cm) diameter holes in 0.18 in. (0.46cm) thick GM3013A or equivalent graphite/epoxy corrugated spar without backup material and without coolant. Developed to produce holes in blind areas, optimal techniques yielded holes of high quality, with minimal or acceptable delamination and/or fiber extension on drill-exit side.

B87-10297

ACOUSTIC LEVITATION WITH ONE TRANSDUCER

MARTIN B. BARMATZ (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16867

Vol. 11, No. 6, P. 68

Higher resonator modes enables simplification of equipment. Experimental acoustic levitator for high-temperature containerless processing has round cylindrical levitation chamber and only one acoustic transducer. Stable levitation of solid particle or liquid drop achieved by exciting sound in chamber to higher-order resonant mode that makes potential well for levitated particle or drop at some point within chamber.

B87-10298

THERMAL STRESSES IN SILICON-WEB GROWTH

BEN K. WADE (Caltech), SENOL UTKU (Duke University), and SUJIT KUMAR RAY (Duke University)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16824

Vol. 11, No. 6, P. 70

Mathematical model represents thermomechanical behavior of solid web of rectangular cross section as pulled from melt of same material. Intended for application to growth of silicon webs or ribbons, model general enough to be applicable to other materials as well. Shows suitable temperature distribution results in stress-free ribbon. Conceptual ribbon of rectangular cross section pulled from melt. Simplified configuration used to calculate thermal conditions for stress-free ribbon.

B87-10299

ECONOMICAL JOINT FOR TRUSS STRUCTURES

CARLETON J. MOORE

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28160

Vol. 11, No. 6, P. 72

Mass-produced flat parts easily assembled. Joint for three-dimensional truss made of simple die-cut plates and inexpensive fasteners. Each truss joint consists of two identical interlocking plates bolted, welded, or glued together. Truss struts bolted to joint through holes in plate. Alternatively, ends of struts forked so that they slip over plates and fastened to them by bolts or pins.

B87-10300

REMOVING SILICON MONOXIDE FROM NICKEL MIRRORS

JOHN J. ZANIEWSKI

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13079

Vol. 11, No. 6, P. 72

Combination of polishing tool and polishing mixture used to remove adherent fragments of silicon monoxide protective coatings from nickel/aluminum mirrors without altering shapes or harming polishes of mirror surfaces. Polishing technique developed to prepare stained mirrors for recoating to restore high reflectance.

B87-10301

VACUUM HOLD-DOWN SYSTEM FOR HEAT-TREATING THIN FILMS

EARL R. COLLINS, JR. (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16892

Vol. 11, No. 6, P. 73

In improved furnace concept for heat-treating thin films, vacuum ports in vacuum plate(s) hold films connected together in zones so vacuum applied separately to each zone. Allows material being held to shrink or expand while still being held in place. Unclamped zones expand or contract, relieving local stresses so entire sheet accommodates thermally induced changes without cracking. Applications include manufacture of thin semiconductor films for solar cells and of membranes for electrolytic production of oxygen.

B87-10302

ELECTROCHEMICAL MACHINING REMOVES DEEP OBSTRUCTIONS

MARK J. CATANIA (Rockwell International Corp.)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29118

Vol. 11, No. 6, P. 74

Electrochemical machining (ECM) is effective way of removing obstructing material between two deep holes supposed to intersect but do not because of misalignment of drilling tools. ECM makes it possible to rework costly castings otherwise scrapped. Method fast even for tough or hard alloys and complicated three-dimensional shapes.

B87-10303

SIMULATING BUILDING FIRES FOR MOVIES

RICARDO C. RODRIGUEZ (Essex Corp.), and RANDALL P. JOHNSON (Essex Corp.)

Jun. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-26044

Vol. 11, No. 6, P. 75

Fire scenes for cinematography staged at relatively low cost in method that combines several existing techniques. Nearly realistic scenes, suitable for firefighter training, produced with little specialized equipment. Sequences of scenes set up quickly and easily, without compromising safety because model not burned. Images of fire, steam, and smoke superimposed on image of building to simulate burning of building.

B87-10341

INTEGRATED ANALYSIS CAPABILITY PROGRAM

HAROLD P. FRISCH, JOAN A. SANBORN, ROBERT G. VOS (Boeing Aerospace Corp.), DAVID L. BESTE (Boeing Aerospace Corp.), and JOSEPH GREG (Boeing Aerospace Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12992 GSC-12994

Vol. 11, No. 7, P. 62

Integrated Analysis Capability (IAC) software system provides highly effective, interactive analysis tool for integrated design of large structures. Developed to serve as interface for programs from fields of structures, thermodynamics, controls, and system dynamics with executive system and data base to yield highly-efficient multidisciplinary system. Written in FORTRAN 77.

B87-10363

OPTICAL MONITOR FOR ROTATING WELDING TURRET

STEPHEN G. BABCOCK (Rockwell International Corp.), GERALD E. DYER (Rockwell International Corp.), and STEPHEN S. GORDON (Rockwell International Corp.)

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29177

Vol. 11, No. 7, P. 86

Set of internal mirrors in welding-torch turret allows weld seam to be monitored regardless of angle between turret and torch. Turret rotated as necessary to reach various positions on workpiece. Optical system simple, compact, and placed in commercially available 90 degrees welding torch.

B87-10364**MAKING DOUBLE-BEVEL END CUTS ON TUBES**

JOSEPH R. CARDENAS (Rockwell International Corp.), and HARVEY L. BERG (Rockwell International Corp.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21135**Vol. 11, No. 7, P. 87**

Fixture for power saw saves time, eliminates waste, and ensures precision. Positions tube for 45 degrees end cut, then repositions for cut at 90 degrees to first cut. Roller chain holds tube in place for both cuts.

B87-10365**FAST MELTING AND FREEZING FOR MICROGRAVITY EXPERIMENTS**

RICHARD M. POORMAN

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27181**Vol. 11, No. 7, P. 88**

Commercial tube welders adapted to metallurgical research. Proposed furnace melts and resolidifies small metal samples during brief periods. In furnace, sample surrounded by large heat sinks and rapidly heated near midlength by intense source of heat. Furnace intended for use in experiments in microgravity: entire melting-and-freezing process requires less than 20 s of near weightlessness experienced in parabolic climb and dive of KC-135 airplane.

B87-10366**SHAPING COMPONENT LEADS FOR SMALL-SCALE PRODUCTION**

LAWRENCE JAN (Loral Electro Optical Systems, Inc.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16863**Vol. 11, No. 7, P. 89**

Simple tool makes it easy to bend leads of electronic components quickly and uniformly for assembly on circuit board. Useful in small-scale production of electronic circuits; saves labor but avoids cost of complicated machinery. Made in range of sizes to accommodate components in variety of dimensions.

B87-10367**ALTERNATING-POLARITY ARC WELDING**

R. J. SCHWINGHAMER

Jul. 1987 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27147**Vol. 11, No. 7, P. 89**

Brief reversing polarity of welding current greatly improves quality of welds. NASA technical memorandum recounts progress in art of variable-polarity plasma-arc (VPPA) welding, with emphasis on welding of aluminum-alloy tanks. VPPA welders offer important advantages over conventional single-polarity gas/tungsten arc welders.

B87-10368**HOT-GAS NOZZLE FOR DESOLDERING LEADLESS IC'S**

MARK T. HANLON (Caltech), and ROBERT M. DEERING (Caltech)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16897**Vol. 11, No. 7, P. 90**

Simple hand-held tool removes leadless, surface-mounted integrated circuits (IC's) from printed-circuit boards. Nozzle used

with hot-air gun of type used to apply heat-shrink tubing or with some other source of hot gas. Rectangular end of nozzle and deflector shape airflow pattern to concentrate heat directly on soldering pads located around edge of IC's to heat them quickly and uniformly.

B87-10369**APPLYING TAPE IN VACUUM OR AIR**

KARYN S. DOWNS (Martin Marietta), and KENNETH A. KARKI (Martin Marietta)

Jul. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28187**Vol. 11, No. 7, P. 91**

Cost and complexity reduced. Device applies adhesive second-surface-mirror tape to flat surfaces. Use of device replaces previous application of tape by time-consuming and labor-intensive procedure of autoclaving in vacuum bags.

B87-10370**MINIMUM JOINT GAP FOR ROBOTIC WELDER**

K. J. GANGEL (Rockwell International Corp.), and J. L. WEEKS (Rockwell International Corp.)

Jul. 1987 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27144**Vol. 11, No. 7, P. 92**

Report describes evaluation of factors influencing minimum-gap requirement for robot-welded joint. Evaluations part of series on vision-based welding-control system.

B87-10424**WEDGE JOINTS FOR TRUSSES**

KENNETH E. WOOD (Rockwell International Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21072**Vol. 11, No. 8, P. 80**

Structure assembled rapidly with simple hand tools. Proposed locking wedge joints enable rapid assembly of lightweight beams, towers, scaffolds, and other truss-type structures. Lightweight structure assembled from tubular struts joined at nodes by wedge pins fitting into mating slots. Joint assembled rapidly by seating wedge pin in V-shaped slots and deforming end of strut until primary pawl engages it.

B87-10425**PUNCHING HOLES IN THIN METALS**

RICHARD GARCIA (Rockwell International Corp.), DERRELL FOSTER (Rockwell International Corp.), and VALENTINO MIRANDA (Rockwell International Corp.)

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21134**Vol. 11, No. 8, P. 82**

Simple punching tool used to make holes in thin metal sheets, without burrs and edge deformations. Tool used on such materials as stainless steel, nickel alloys, beryllium, copper, and aluminum, in thicknesses of 0.002 to 0.010 in. With new punch, hole size held to tolerance of 0.025 mm. Includes rubber punch extruding into hole in top plate, pushing out exposed portion of clamped metal sheet.

B87-10426**DEVICE APPLIES FILMS TO OPTICAL ELEMENTS**

GORDON C. AUGASON

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

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ARC-11611 Vol. 11, No. 8, P. 82

Clamping device applies protective or antireflective dielectric coating to lenses or other optical elements. Alternative version of device applies thin sheet of dielectric film to ring or stretches it for clamping in holder to form pellicle or beam splitter. Defects avoided by new apparatus, which uniformly stretches dielectric films in radial direction and creates vacuum between them before thermally bonded to optical element.

B87-10427 **FILAMENT-WINDING TECHNIQUE FOR CONCAVE PARTS**

DONALD CARTER (United Technologies Corp.), and DAVID SCHMALING (United Technologies Corp.)

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11672 Vol. 11, No. 8, P. 87

Dummy mold and vacuum bagging yield accurate part girth. Proposed method of filament winding facilitates accurate fabrication of fiber/matrix composite parts having closed sections with concave surfaces. Parts laid up by hand now wound with filaments; reducing time and cost of fabrication and improving quality of parts.

B87-10428 **PORTABLE CHAMFERING TOOL**

LEO A. BERSON (Rockwell International Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21087 Vol. 11, No. 8, P. 88

Portable machine tool precisely cuts chamfer on valve seat. With tool, delicate machining operation done without removing part to machine shop. Taken to part and used wherever pressurized air and electric power available. Plug and bushing nest in bore chamfered. They guide steady cutter rod as it cuts 15 degrees chamfer on top edge of bore.

B87-10429 **LASER SCANNER FOR TILE-CAVITY MEASUREMENT**

STANLEY Y. YOSHINO (Rockwell International Corp.), DONALD H. WYKES (Rockwell International Corp.), GEORGE R. HAGEN (Rockwell International Corp.), GENE E. LOTGERING (Rockwell International Corp.), MICHAEL B. GAYNOR (Rockwell International Corp.), PAUL G. WESTERLUND (Rockwell International Corp.), and THOMAS A. BAAL (Rockwell International Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21136 Vol. 11, No. 8, P. 88

Irregular surfaces mapped and digitized for numerical-control machinery. Fast, accurate laser scanning system measures size and shape of cavity without making any physical contact with cavity and walls. Measurements processed into control signals for numerically controlled machining of tile or block to fit cavity. System generates map of grid points representing cavity and portion of outer surface surrounding cavity. Map data used to control milling machine, which cuts tile or block to fit in cavity.

B87-10430 **MAKING OPTICAL CORRECTORS BY DIAMOND TURNING**

ADEN B. MEINEL (Caltech), MARJORIE P. MEINEL (Caltech), JOHN E. STACY (Caltech), THEODORE T. SAITO (Lawrence Livermore National Laboratory), and STEVEN R. PATTERSON (Lawrence Livermore National Laboratory)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16918 Vol. 11, No. 8, P. 90 Large Optics Diamond Turning Machine (LODTM) at Lawrence

Livermore National Laboratory used to make highly amorphous reflecting wavefront-corrector plates with rms difference between desired and measured reflector surfaces of only 0.075 wave. Measured errors correspond to one standard deviation of uncertainties in digitization and reduction of interferograms of surface. Appears accuracy of LODTM-generated surface exceeds current ability to measure it. Work demonstrates feasibility of single-point diamond turning for manufacture of generalized wavefront-control surfaces or other unusual surfaces desired by optical designers.

B87-10431 **SUPPORTS FOR WIRES SOLDERED TO PINS**

ARTHUR J. HILL (Rockwell International Corp.)

Sep. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29171 Vol. 11, No. 8, P. 91

Stress concentrations reduced by reorienting wires. New solder-joint configuration provides support for part of wire most susceptible to damage from handling or vibration part next to solder joint. Reversal of wire and heat-shrinkable tubing reduce stress in this region.

B87-10432 **HIGH-DENSITY-TAPE CASTING SYSTEM**

EARL R. COLLINS, JR. (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16901 Vol. 11, No. 8, P. 91

Centrifuge packs solids from slurry into uniform, dense layer. New system produces tapes of nearly theoretical packing density. Centrifugal system used to cast thin tapes for capacitors, fuel cells, and filters. Cylindrical rotary casting chamber mounted on high-speed bearings and connected to motor. Liquid for vapor-pressure control and casting slurry introduced from syringes through rotary seal. During drying step, liquid and vapor vented through feed tubes or other openings. Laminated tapes produced by adding more syringes to cast additional layers of different materials.

B87-10433 **LEVITATION BY HEAT RADIATION IN MICROGRAVITY**

PHILIP I. MOYNIHAN (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17022 Vol. 11, No. 8, P. 92

Report presents calculations relating to feasibility of proposed heating-and-levitating technique for use in microgravity. In material-processing system based on this technique, specimen heated to required processing temperature by thermal radiation, and pressures of radiation impinging on specimen from different directions controlled to push specimen toward desired position. Technique used in spaceborne manufacturing processes and experiments requiring levitation in vacuum to prevent contamination of any kind from reaching specimens.

B87-10434 **EFFECTS OF CONTROL PARAMETERS ON A ROBOT WELDER**

K. J. GANGL (Rockwell International Corp.), and J. L. WEEKS (Rockwell International Corp.)

Sep. 1987 Additional Information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD. 21240

MFS-28162 Vol. 11, No. 8, P. 92 Gains and weighting factors in vision-based controller evaluated.

Report describes study of trajectory control in vision-based robotic welder. Covers evaluation of user-programmable parameters that dictate control response to perceived error in tracking weld seam.

B87-10435

STUDY OF SILICON-WEB GROWTH

ROBERT RICHTER (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16964

Vol. 11, No. 8, P. 93

Study of dendritic-web growth of single-crystal silicon casts doubts on previously accepted physical concepts of process.

B87-10436

LINEAR ANOMALY IN WELDED 2219-T87 ALUMINUM ALLOY

WARTAN A. JEMIAN (Auburn University)

Sep. 1987 Additional information on Microfiche available through: NASA STI Facility, TU Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27152

Vol. 11, No. 8, P. 93

Study of causes and significance of two types of linear anomalies sometimes appearing in radiographs of welds described in preliminary report. Manifested as light or dark linear features parallel to weld line in radiograph of weld. Contains diagrams and descriptions of phenomena occurring during welding process. Includes microdensitometer traces from x-radiographs of actual welds and from computer simulations based calculation of x-ray transmission through assumed weld structures. Concludes anomalies not unique to 2219-T87 aluminum alloy.

B87-10498

SINGLE-AXIS ACOUSTIC LEVITATOR WITH ROTATION CONTROL

E. H. TRINH (Caltech), and E. E. OLLI (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16924

Vol. 11, No. 9, P. 96

Rotation-control equipment simplified. Acoustic levitator with rotation control handles liquid and solid specimens as dense as steel in both low gravity and normal Earth gravity. Levitator is single-axis type.

B87-10499

PRESET ELECTRODES FOR ELECTRICAL-DISCHARGE MACHINING

BILL E. COKER (Rockwell International Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29198

Vol. 11, No. 9, P. 97

New electrode holder for electrical-discharge machining (EDM) provides for repeatable loading and setting of many electrodes. New holder is rotating-index tool carrying six, eight, or more electrodes. Before use, all electrodes set with aid of ring surrounding tool, and locked in position with screws. When electrode replaced, EDM operator pulls spring-loaded pin on tool so it rotates about center pin. Fresh electrode then rotated into position against workpiece.

B87-10500

HIGHER-QUALITY WELD JOINTS FOR TUBE SECTIONS

JOHN T. OLSZEWSKI (Rockwell International Corp.)

Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29190

Vol. 11, No. 9, P. 97

Less material in weld inserts results in better fusion. Redesigned insert for joining tubes by welding improves quality of weld. In new insert, leg of T shorter so it does not protrude into tube cavity.

B87-10501

PRESSURE-LOCALIZING INSERTS FOR BAGGING LAMINATIONS

DAVE SCHMALING (United Technologies Corp.), and DONALD CARTER (United Technologies Corp.)

Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11673

Vol. 11, No. 9, P. 98

Devices compress composite laminates to conform to tight inside corners of molds. Proposed use of pressure-localizing insert allows composite laminates to be compacted into tight corners by conventional pressure or vacuum-bagging techniques. Because of manufacturing technique, larger selection of part shapes becomes amenable to lamination.

B87-10502

REPAIRING HOLES IN PRESSURE WALLS

PAUL BRUCE Y. MORI (Boeing Co.), LAURIE J. CAPRILOA (Boeing Co.), ALEXANDER R. COROCADO (Boeing Co.), MARTIN N. GIBBINS (Boeing Co.), and ROBERT B. HORNE (Boeing Co.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28179

Vol. 11, No. 9, P. 99

Patches and easy-to-use tools yield pressure-tight seal. Repairer lifts patch from repair kit with hook-and-pile-tipped tool and positions it over puncture hole. With tool, even gloved repairer easily manipulates patch without damaging it.

B87-10503

GROWING II/VI SEMICONDUCTORS WITH DOUBLE DECANTATION

ANDREW D. MORRISON (Caltech)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16808

Vol. 11, No. 9, P. 99

Concept for growing single crystals combines sheet solidification with controlled cooling. Proposed method for II/VI semiconductor compounds cools newly solidified crystal gradually and nearly isothermally so few defects formed. Method obtains maximum amount of crystal from minimum amount of melt. Double decantation causes sheet crystal to cool first in liquid, then in gas. Vessel tilted to pour off molten semiconductor material. Second tilt, in opposite direction, pours off encapsulant.

B87-10504

CERAMIC ADHESIVE FOR HIGH TEMPERATURES

EVERETT G. STEVENS (Rockwell International Corp.)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21085

Vol. 11, No. 9, P. 100

Fused-silica/magnesium-phosphate adhesive resists high temperatures and vibrations. New adhesive unaffected by extreme temperatures and vibrations. Assuring direct bonding of gap filters to tile sidewalls, adhesive obviates expensive and time-consuming task of removal, treatment, and replacement of tiles.

B87-10505

CONTAMINATION-FREE ELECTRICAL-DISCHARGE MACHINING

08 FABRICATION TECHNOLOGY

MARK G. SCHMIDT (Rockwell International Corp.)
Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29197

Vol. 11, No. 9, P. 101

Contamination of parts by electrical-discharge machining (EDM) almost completely eliminated by reversing flow of coolant. Flow reversed from usual direction so coolant carries contaminants out through passage in electrode. Coolant for reverse flow is pressurized dichlorodifluoromethane vapor.

B87-10506

GLASS-BEAD BLASTING ALTERS ANTENNA SURFACE

JAMES W. FORTENBERRY (Caltech), RICHARD L. JILKA (Caltech), BOYCE KIMMEL (Caltech), RAMON D. GARCIA (Caltech), RICHARD E. COFIELD (Caltech), GERHARDT J. KLOSE (Caltech), and THOMAS O'TOOLE (Caltech)
Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16898

Vol. 11, No. 9, P. 101

Thermal-emissivity properties improved, and focal length adjusted. Experiments show gentle blasting with glass beads produces beneficial changes in macroscopic surface shapes and in microscopic surface features of lightweight microwave reflectors made of thin metal reflective surfaces on deformable substrates of aluminum honeycomb.

B87-10507

PIN INSERTS FOR PLUG WELDS

MICHAEL PENNINGER (Rockwell International Corp.)
Oct. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29193

Vol. 11, No. 9, P. 102

Leakage through minute cracks eliminated. Electron-beam-welded pins reinforce material around coolant holes during plug welding and subsequent remachining. Pins removed in final machining of 0.188-in diameter hole.

B87-10550

CALCULATION OF MULTICOMPONENT CONVECTIVE DIFFUSION DEPOSITION

SULEYMAN A. GOKOGLU (Analex Corp.), DANIEL E. ROSNER (Yale University), and BOR-KUAN CHEN (Yale University)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14366

Vol. 11, No. 10, P. 67

Computer program calculates rates of deposition by vapor or by small particles. Embodies comprehensive but tractable theory of rates of convective diffusion deposition developed on basis of assumption of multicomponent, chemically-frozen boundary layer. Program written in FORTRAN IV.

B87-10564

GRINDING INSIDE A TOROIDAL CAVITY

WALTER MAYER (Rockwell International Corp.), JAMES F. ADAMS (Rockwell International Corp.), and RICHARD K. BURLEY (Rockwell International Corp.)

Nov. 1987 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29249

Vol. 11, No. 10, P. 91

Weld lines ground smooth within about 0.001 in. Grinding tool for smoothing longitudinal weld lines inside toroidal cavity includes curved tunnel jig to guide grinding 'mouse' along weld line. Curvature of tunnel jig matched to shape of toroid so grinding ball in mouse follows circular arc of correct radius as mouse is pushed

along tunnel. Tool enables precise control of grindout shape, yet easy to use.

B87-10565

HYBRID ELECTROSTATIC/ACOUSTIC LEVITATOR

WON K. RHIM (Caltech), EUGENE H. TRINH (Caltech), SANG K. CHUNG (Caltech), and DANIEL D. ELLEMAN (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16834

Vol. 11, No. 10, P. 91

Because electrostatic and acoustic forces independent of each other, hybrid levitator especially suitable for studies of drop dynamics. Like all-acoustic or all-electrostatic systems, also used in studies of containerless material processing. Vertical levitating force applied to sample by upper and lower electrodes. Torques or vibrational forces in horizontal plane applied by acoustic transducers. Electrically charged water drop about 4 mm in diameter levitated electrostatically and rotated acoustically until it assumed dumbbell shape and broke apart.

B88-10064

TOOL REMOVES ARC-LIGHT REFLECTORS

STEPHEN S. GORDON (Rockwell International Corp.)

Jan. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29235

Vol. 12, No. 1, P. 93

New tool makes installation, adjustment, and removal of self-clamping arc-light reflectors on welding torches easy and simple. Consists of two arms reaching around from back of torch. Lip on each arm hooks into slot of arc-light reflector clamp. When handles squeezed together, slot spreads enabling easy installation, adjustment, or removal of reflector without disassembly of welding apparatus.

B88-10065

TRUSS-CORE CORRUGATION

RANDALL C. DAVIS, and L. R. JACKSON

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13438

Vol. 12, No. 1, P. 93

Strength-to-weight ratio exceeds beaded-web design by 60 percent. New corrugation design offers significant weight saving. Truss-core web replaces beaded web of previous corrugation designs.

B88-10066

FIELD REPAIR OF THERMOPLASTIC WINDOWS AND CANOPIES

ROBERT L. FOX, and JAMES R. TYERYAR

Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13525

Vol. 12, No. 1, P. 94

Toroid bonding techniques further developed to meet typical field-repair requirements. Induction-heating power supply engineered into 'ruggedized' solid-state unit, in a 1-ft to the third power package weighing 20 lb. Hand-held bonding gun weighing 3 lb plugs into this power supply on long cord. Maximum power required is 300 W. Lightly loaded repair bonds made in several minutes at average power input of 150 W on metallic, polymeric, or polymermatrix materials.

B88-10067

PROTECTIVE COATING FOR LASER DRILLING OF SILICON

PAUL J. SHLICHTA (Caltech)

Jan. 1988 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17148

Vol. 12, No. 1, P. 95

Sodium silicate prevents spattered silicon from fusing with surrounding material. Sodium silicate solution applied to wafer by dipping and draining or by spinning; application by spraying also works. When dried in oven, solution leaves thin coating of sodium silicate glass.

B88-10133

PREASSEMBLY OF INSULATING TILES

Y. D. IZU (Lockheed Missiles and Space Co.), E. N. YOSHIOKA (Lockheed Missiles and Space Co.), and T. ROSARIO (Lockheed Missiles and Space Co.)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21204

Vol. 12, No. 2, P. 80

Concept for preassembling high-temperature insulating tiles speeds and simplifies installation and repair and reduces damage from handling. Preassembly concept facilitates placement of tiles on gently contoured surfaces as well as on flat ones. Tiles bonded to nylon mesh with room-temperature-vulcanizing silicon rubber. Spacing between tiles is 0.03 in. Applications include boilers, kilns, and furnaces.

B88-10134

ANODIZATION AS A REPAIR TECHNIQUE

ROY E. GROFF (Martin Marietta Corp.), ROBERT D. MALONEY (Martin Marietta Corp.), and ROBERT W. REESER (Martin Marietta Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21177

Vol. 12, No. 2, P. 80

Thin, hard oxide layer added to aluminum part. Surfaces on aluminum part worn out of tolerance by no more than 0.004 in. often repaired by anodizing to build up aluminum oxide layers. Oxide layers very hard and grounded to desired final dimensions.

B88-10135

ELECTROSTATIC LIQUID-DROP-LEVITATION SYSTEM

WON KYU RHIM (Caltech), SAN KUN CHUNG (Caltech), MICHAEL T. HYSON (Caltech), and DANIEL D. ELLEMAN (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16823

Vol. 12, No. 2, P. 82

Electrostatic levitator has levitated drops of liquid up to 4 mm in diameter while maintaining spherical drop shapes. Stable levitation of spherical drops valuable in experiments involving super-cooling, solidification, and crystal growth.

B88-10136

ELECTRON BEAM 'WRITES' SILICON ON SAPPHIRE

KLAUS HEINEMANN (Stanford University)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

ARC-11411

Vol. 12, No. 2, P. 82

Method of growing silicon on sapphire substrate uses beam of electrons to aid growth of semiconductor material. Silicon forms as epitaxial film in precisely localized areas in micron-wide lines. Promising fabrication method for fast, densely-packed integrated circuits. Silicon deposited preferentially in contaminated substrate zones and in clean zone irradiated by electron beam. Electron beam, like surface contamination, appears to stimulate decomposition of silane atmosphere.

B88-10137

CERAMIC WELDING-TORCH EXTENSION

STEPHEN S. GORDON (Rockwell International Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29252

Vol. 12, No. 2, P. 83

Simple attachment extends torch to difficult-to-reach joints. Bushing, gasket, and extender mate with gascup to form extension assembly. Extender designed and fabricated to suit particular job.

B88-10138

CHECKING NICKEL PLATE FOR POROSITY

MICHAEL D. ROBERTS (Rockwell International Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29246

Vol. 12, No. 2, P. 83

Porosity test goes for free ride with cryogenic adhesion test. Frosted areas marked so pores found after frost disappears. Plating stylus used for local repair of nickel layer.

B88-10139

IMAGE CONTROL IN AUTOMATIC WELDING VISION SYSTEM

RICHARD W. RICHARDSON (Ohio State University)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26035

Vol. 12, No. 2, P. 84

Orientation and brightness varied to suit welding conditions. Commands from vision-system computer drive servomotors on iris and Dove prism, providing proper light level and image orientation. Optical-fiber bundle carries view of weld area as viewed along axis of welding electrode. Image processing described in companion article, 'Processing Welding Images for Robot Control' (MFS-26036).

B88-10140

PROCESSING WELDING IMAGES FOR ROBOT CONTROL

RICHARD W. RICHARDSON (Ohio State University)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26036

Vol. 12, No. 2, P. 84

Image data from two distinct windows used to locate weld features. Analyzer part of vision system described in companion article, 'Image Control in Automatic Welding Vision System' (MFS-26035). Horizontal video lines define windows for viewing unwelded joint and weld pool. Data from picture elements outside windows not processed. Widely-separated local features carry no significance, but closely spaced features indicate welding feature. Image processor assigns confidence level to group of local features according to spacing and pattern.

B88-10141

PLASMA SPRAYING OF DENSE, ROUGH BOND COATS

ROBERT A. MILLER, BRIAN J. EDMONDS, and GEORGE W. LEISSLER (Sverdrup Technology, Inc.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14526

Vol. 12, No. 2, P. 91

Simple modification of plasma torch facilitates spraying of coarse powders. Shape of nozzle changed to obtain decrease in velocity of gas and consequent increase in time particles spend in flame before impact on substrate. Increased residence time allows melting of coarser powders, spraying of which results in rougher bond surfaces.

B88-10142
COMPUTER-GRAPHICAL SIMULATION OF ROBOTIC WELDING

KEN FERNANDEZ (Society of Manufacturing Engineers), and GEORGE COOK (Society of Manufacturing Engineers)
 Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28199 Vol. 12, No. 2, P. 91
 Computer program ROBOSIM, developed to simulate operations of robots, applied to preliminary design of robotic arc-welding operation. Limitations on equipment investigated in advance to prevent expensive mistakes. Computer makes drawing of robotic welder and workpiece on positioning table. Such numerical simulation used to perform rapid, safe experiments in computer-aided design or manufacturing.

B88-10143
MICROMACHINING OF SILICON

JOHN E. DICKMAN
 Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14481 Vol. 12, No. 2, P. 92
 Etching rates of alloys and heavily-doped semiconductor materials significantly higher than lightly doped semiconductor if proper etching system used. Selectivity used to etch regions of semiconductor preferentially while not etching other unmasked regions. When selective etching used with laser-induced-diffusion techniques, possible to make structures that cannot be made at present. Possible to produce well-defined structures in and through wafer while not damaging existing structures on wafer.

B88-10144
FOLDING TRUSS STRUCTURE

AUBREY D. WARREN (Rockwell International Corp.)
 Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21255 Vol. 12, No. 2, P. 92
 Concept for foldable and deployable truss offers advantages of strength, rigidity, and mechanical simplicity. Structure consists of series of boxlike bays with 9-ft sides. Each box has panels on top and bottom and two sides. Two remaining sides open. Panels hinged at connecting edges. Adapted to terrestrial transportable structures, scaffolds, cranes, and rows of cubicles.

B88-10145
ORIENTING ACOUSTICALLY-LEVITATED ASPHERICAL OBJECTS

MARTIN B. BARMATZ (Caltech)
 Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16846 Vol. 12, No. 2, P. 93
 By suitable adjustments of amplitudes and phases of three acoustic fields in three-axis acoustic levitator, orientation of aspherical levitated object controlled, and degree of asphericity measured. Orientation-and-measurement technique used to manipulate workpieces during containerless processing or to measure approach to desired asphericity in small objects like targets for laser-fusion experiments. Several versions of technique.

B88-10146
PERISCOPE FOR VIEWING WELD PENETRATION

STEPHEN S. GORDON (Rockwell International Corp.), and JONATHAN M. MARMAN (Rockwell International Corp.)
 Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.
MFS-29346 Vol. 12, No. 2, P. 94

Periscope enables viewing of weld joint from inside cylindrical duct to determine when weld penetration occurs. Supplies steady stream of inert gas to shield joint. Device used to calibrate and evaluate techniques for sensing weld penetration.

B88-10147
FORMING SOLAR-CELL JUNCTIONS BY FLASH DIFFUSION

PAUL ALEXANDER, JR. (Caltech), and ROBERT B. CAMPBELL (Westinghouse Electric Co.)
 Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17048 Vol. 12, No. 2, P. 95
 Modified fabrication process simultaneously forms front and back junctions of silicon photovoltaic cells. With flash diffusion, junctions formed in 10 to 20 seconds. Cost reductions of 25 to 30 percent expected with modified process. Devices produced have performance equal to or better than cells made by conventional diffusion.

B88-10196
COVER FOR DUCT EXPANSION JOINT

A. R. BROWN (Rockwell International Corp.)
 Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29189 Vol. 12, No. 3, P. 67
 Size and shape of cover reduces stress and increases strength. Cover for expansion joints on duct-work seals tightly while accommodating movement of joint. Provides ample bonding area on both members of joint.

B88-10197
ROTATION CONTROL IN A CYLINDRICAL ACOUSTIC LEVITATOR

M. B. BARMATZ (Caltech), and J. L. ALLEN (Caltech)
 Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16995 Vol. 12, No. 3, P. 67
 Second driver introduces net circulation around levitated sample. Two transducers produce two sets of equal counterrotating acoustic fields. By appropriate adjustment of amplitudes and phases in two transducers, total acoustic field made to consist of two unequal counterrotating fields, producing net torque on levitated sample.

B88-10198
TOOL PROTECTS INTERNAL THREADS DURING REWORK

GARY E. DEESE (Rockwell International Corp.)
 Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29234 Vol. 12, No. 3, P. 68
 Tool protects part of internal thread from damage while surface is ground or machined. Collects machining debris so they do not contaminate part.

B88-10199
FLEXIBLE PROTECTIVE SHIELD FOR NEWLY WELDED JOINTS

GERALD E. DYER (Rockwell International Corp.)
 Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29260 Vol. 12, No. 3, P. 69
 Simple device promotes defect-free welds in oxidation-prone metals. Welding torch pulls trailing shield behind to provide protective shield of argon gas over hot weld bead. Guide at front

of torch holder feeds welding wire to joint. Shield bent or straightened to fit closely against weld joint.

B88-10200**REAL-TIME X-RAY INSPECTION**

RONALD V. BULTHUIS (Rockwell International Corp.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29217

Vol. 12, No. 3, P. 70

X-ray imaging instrument adapted to continuous scanning. Modern version of fluoroscope enables rapid x-ray inspection of parts. Developed for detection of buckling in insulated ducts. Uses radiation from radioactive gadolinium or thallium source. Instrument weighs only 6 1/2 lb. Quickly scanned by hand along duct surface, providing real-time image. Based on Lixiscope, developed at Goddard Space Flight Center.

B88-10201**FIXTURE FOR POLISHING OPTICAL-FIBER ENDS**

LEROY H. BARLOW (RCA Corp.), and VINCENT A. PIRONE (RCA Corp.)

Mar. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13510

Vol. 12, No. 3, P. 70

Wedge and beveled ends lapped with precision for laser applications. See 'Wedge Fibers Suppress Feedback of Laser Beam' (LAR-13074). For obtuse-angled wedge end, both sides of fiber polished similarly. After one side of fiber is lapped, fiber support removed. Holding block with fiber turned over, and fiber support replaced. Second side of fiber then lapped.

B88-10202**NEW ACOUSTIC TREATMENT FOR AIRCRAFT SIDEWALLS**

RIMAS VAICAITIS (Columbia University)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13545

Vol. 12, No. 3, P. 71

New aircraft-sidewall acoustic treatment reduces interior noise to acceptable levels and minimizes addition of weight to aircraft. Transmission of noise through aircraft sidewall reduced by stiffening device attached to interior side of aircraft skin, constrained-layer damping tape attached to stiffening device, porous acoustic materials of high resistivity, and relatively-soft trim panel isolated from vibrations of main fuselage structure.

B88-10258**GROWING WIDER SILICON RIBBONS**

C. S. DUNCAN (Westinghouse Electric Corp.), and P. A. PIOTROWSKI (Westinghouse Electric Corp.)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17054

Vol. 12, No. 4, P. 66

New lid design makes larger withdrawal opening feasible. Wider silicon ribbons grown by dendritic-web method with proposed modification of furnace lid. Modification increases by about 22 percent size of portion of lid that limits ribbon width, potentially increasing area of single-crystal silicon ribbon and productivity.

B88-10259**MODIFIED WITHDRAWAL SLOT INCREASES SILICON PRODUCTION**

P. A. PIOTROWSKY (Westinghouse Electric Corp.), and C. S. DUNCAN (Westinghouse Electric Corp.)

Apr. 1988 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17055

Vol. 12, No. 4, P. 67

New shape reduces ribbon breakage and resulting idle time. Shape for slot through which single-crystal silicon ribbon pulled from melt increases productivity. Reduces tendency of emerging ribbon to grow thin and break.

B88-10260**CARBON COATING OF COPPER BY ARC-DISCHARGE PYROLYSIS**

BEN T. EBIHARA, and STANLEY JOPEK

Apr. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14454

Vol. 12, No. 4, P. 67

Adherent, abrasion-resistant coat deposited with existing equipment. Carbon formed and deposited as coating on copper substrate by pyrolysis of hydrocarbon oil in electrical-arc discharges. Technique for producing carbon deposits on copper accomplished with electrical-discharge-machining equipment used for cutting metals. Applications for new coating technique include the following: solar-energy-collecting devices, coating of metals other than copper with carbon, and carburization of metal surfaces.

B88-10261**SUBLID SPEEDS GROWTH OF SILICON RIBBON**

R. G. SEIDENSTICKER (Westinghouse Electric Corp.), and J. P. MCHUGH (Westinghouse Electric Corp.)

Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17056

Vol. 12, No. 4, P. 68

Heat shield permits enhancement of exit cooling without formation of unwanted crystals. Thermal barrier between molten silicon and lid of susceptor and crucible allows solidifying ribbon of silicon to be withdrawn faster. Barrier, or sublid, increases production rate.

B88-10312**ROTARY REACTOR MAKES LARGE LATEX PARTICLES**

DALE M. KORNFELD

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28214

Vol. 12, No. 5, P. 76

Machine reduces gravitational effects interfering with particle growth. Reaction chamber rotates while polymerization of latex proceeds. Motor turns stirrer. Chamber made of stainless steel with glass windows.

B88-10313**HOLDER FOR SHOT PEENING**

BILL E. COKER (Rockwell International Corp.)

May 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29242

Vol. 12, No. 5, P. 77

Fixture delimits peened area precisely while boosting productivity. New fixture ensures small tolerances essential for turbine blades. Opens and closes quickly so finished part removed and new part inserted.

B88-10314**HEAT-SHRINKABLE, SEAMLESS FABRIC TUBE**

DONAT J. E. LAPOINTE (Albany International Research Co.), LAURENCE J. VINCENT (Albany International Research Co.), and LAWRENCE T. WRIGHT (Albany International Research Co.)

May 1988 Additional information available through: NASA STI

08 FABRICATION TECHNOLOGY

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21082 Vol. 12, No. 5, P. 77

Weaving produces generally tapered shape; heat-shrinking gives final shape. Tube woven in tapered shape from polyester yarn. Placed on heated mandrel. Heat shrinks fibers so sheath assumes shape of mandrel. Sheath coated with impermeable material. Useful on Earth for protective garments.

B88-10315

ASSURING PRECISE LFC-SUCTION-STRIP POROSITIES

FRANK H. GALLIMORE (McDonnell-Douglas Corp.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13638 Vol. 12, No. 5, P. 77

Masking technique in bonding perforated titanium sheets to substructures. Technique to obtain precise control of widths of perforated titanium suction strips. Precision required for successful laminar-flow control, (LFC) in flight environments.

B88-10316

INK-JET PRINTER FORMS SOLAR-CELL CONTACTS

PAUL ALEXANDER, JR. (Caltech), R. W. VEST (Purdue University), DON A. BINFORD (Purdue University), and ERIC P. TWEEDELL (Purdue University)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17172 Vol. 12, No. 5, P. 80

Contacts formed in controllable patterns with metal-based inks. System forms upper metal contact patterns on silicon photovoltaic cells. Uses metallo-organic ink, decomposes when heated, leaving behind metallic, electrically conductive residue in printed area.

B88-10354

ULTRASONIC MEASUREMENT OF SILICON-GROWTH INTERFACE

RICHARD C. HEYSER (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17076 Vol. 12, No. 6, P. 78

Position of interface between silicon melt and growing ribbon of silicon measured with aid of reflected ultrasound, according to proposal. Reflections reveal characteristics of ribbon and melt. Ultrasound pulses travel through rods to silicon ribbon growing by dendritic-web process. Rods return reflections of pulses to sonic transducers. Isolate transducers thermally, but not acoustically, from hot silicon melt.

B88-10355

PYROTECHNIC TUBING CONNECTOR

THOMAS J. GRAVES, and ROBERT A. YANG

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21262 Vol. 12, No. 6, P. 78

Tool forms mechanical seal at joint without levers or hydraulic apparatus. Proposed tool intended for use in outer space used on Earth by heavily garbed workers to join tubing in difficult environments. Called Pyrotool, used with Lokring (or equivalent) fittings. Piston slides in cylinder when pushed by gas from detonating pyrotechnic charge. Impulse of piston compresses fittings, sealing around butting ends of tubes.

B88-10356

CONTINUOUS PRODUCTION OF REFRACTORY MICROBALLOONS

CHRISTOPHER H. SCHILLING (Caltech), MARK C. LEE (Caltech), and TAYLOR G. WANG (Caltech)

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16679 Vol. 12, No. 6, P. 80

Continuous process has economic and quality advantages over batch processes. Expected to produce high-quality microballoons at relatively low cost. Continuous hollow-jet process produces microballoons of refractory metal. Microballoon products made by continuous process includes inertial-confinement fusion targets, thermal insulators, lightweight composites, impact absorbers, and containers for hazardous materials.

B88-10357

AUTOMATIC INSPECTION DURING MACHINING

CLYDE L. RANSOM (Rockwell International Corp.)

Jun. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29362 Vol. 12, No. 6, P. 81

In experimental manufacturing process, numerically-controlled machine tool temporarily converts into inspection machine by installing electronic touch probes and specially-developed numerical-control software. Software drives probes in paths to and on newly machined parts and collects data on dimensions of parts.

B88-10393

ARGON WELDING INSIDE A WORKPIECE

GENE E. MORGAN (Rockwell International Corp.)

Jul. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29167 Vol. 12, No. 7, P. 76

Canopies convert large hollow workpiece into inert-gas welding chamber. Large manifold serves welding chamber for attachment of liner parts in argon atmosphere. Every crevice, opening and passageway provided with argon-rich environment. Weld defects and oxidation dramatically reduced; also welding time reduced.

B88-10441

EROSION-RESISTANT WATER-BLAST NOZZLE

MARION L. ROBERTS, R. M. RICE (United Space Boosters, Inc.), and S. A. COSBY (United Space Boosters, Inc.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28218 Vol. 12, No. 8, P. 83

Design of nozzle reduces erosion of orifice by turbulent high-pressure water flowing through it. Improved performance and resistance to erosion achieved by giving interior nozzle surface long, gradual convergence before exit orifice abrupt divergence after orifice and by machining surface to smooth finish.

B88-10442

EROSION-RESISTANT WATER-AND-GRIT-BLASTING ASSEMBLY

MARION L. ROBERTS, R. M. RICE (United States Boosters, Inc.), and S. A. COSBY (United States Boosters, Inc.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28219 Vol. 12, No. 8, P. 83

Nozzle assembly adds abrasive particles to high-pressure water jet. Abrasive nozzle combined with high-pressure tapered stripping nozzle and standard connector. Partial vacuum in relatively large chamber of abrasive-injector housing entrains grit particles from abrasive supply.

B88-10443**LASER MICROMACHINING IN A REACTIVE ATMOSPHERE**

PAUL J. SHLICHTA (Caltech), and GEORGE ZAHAYKEVICH (Advanced Laser Systems, Inc.)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16587

Vol. 12, No. 8, P. 84

Drilling of deep holes in silicon by laser beam aided by conducting operation in reactive atmosphere. Atmosphere reacts with material ejected from hole and converts material to gas flowing away from work area. Hole cleaner and more sharply defined, and debris do not spatter surface of work.

B88-10444**ARC PLASMA GUN WITH COAXIAL POWDER FEED**

ISIDOR ZAPLATYNSKY

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14539

Vol. 12, No. 8, P. 86

Redesigned plasma gun provides improved metallic and ceramic coatings. Particles injected directly through coaxial bore in cathode into central region of plasma jet. Introduced into hotter and faster region of plasma jet.

B88-10445**REPAIR OF GRAPHITE EDM ELECTRODES**

GLENN BUROW (Rockwell International Corp.)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29138

Vol. 12, No. 8, P. 86

Electrodes repaired by silver-filled, epoxy-based adhesive. Because adhesive electrically conductive, electrical conductivity of electrode not impaired.

B88-10446**FORMING N/P JUNCTIONS WITH AN EXCIMER LASER**

PAUL ALEXANDER, JR. (Caltech), ROBERT B. CAMPBELL (Westinghouse Electric Corp.), DAVID C. WONG (Arco Solar), WILLIAM L. BOTTENBERG (Arco Solar), and STANLEY BYRON (Spectra-Physics, Inc.)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16994

Vol. 12, No. 8, P. 88

Compact equipment yields high-quality solar cells. Computer controls pulses of excimer laser and movement of silicon wafer. Mirrors direct laser beam to wafer. Lenses focus beam to small spot on surface. Process suitable for silicon made by dendritic-web-growth process.

B88-10447**SHAPING PLASTIC COVERS QUICKLY AND CHEAPLY**

I. GURMAN (Rockwell International Corp.), and D. MUCKEY (Rockwell International Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29188

Vol. 12, No. 8, P. 90

Fixture enables thermal forming of custom-contoured plastic covers in half hour. In assembled cover-forming fixture, spring-loaded plate presses plastic sheet toward baseplate. Finished covers stacked at left side of table.

B88-10448**MAKING EDM ELECTRODES BY STEREOLITHOGRAPHY**

PHILIP A. BARLAS (Rockwell International Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29480

Vol. 12, No. 8, P. 91

Stereolithography is computer-aided manufacturing technique. Used to make models and molds of electrodes for electrical-discharge machining (EDM). Eliminates intermediate steps in fabrication of plastic model of object used in making EDM electrode to manufacture object or mold for object.

B88-10449**GAS-DIVERTING CUP FOR WELDING AT AN ANGLE**

G. E. DYER (Rockwell International Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29206

Vol. 12, No. 8, P. 92

Attachment makes automatic arc welders more versatile. Stainless-steel diverting cup slips over standard torch cup. Bent electrode inserted in torch. Assembly reaches weld joints inaccessible to straight welding torch.

B88-10450**STARTING VPPA WELDS WITHOUT PILOT HOLES**

W. F. MCGEE (Martin Marietta Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28268

Vol. 12, No. 8, P. 92

Welding current turned on gradually. Current increased gradually over short distance until full operating current reached, and welding proceeds in 'keyhole' mode. Tests in laboratory and in production show gradual-turn-on technique 100 percent reliable.

B88-10451**MAPPING REDISTRIBUTION OF METAL IN WELDS**

SARKIS BARKHOUDARIAN (Rockwell International Corp.)

Sep. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29487

Vol. 12, No. 8, P. 93

Radioactive-tracer technique applied to map redistribution of metal caused by welding process. Surfaces of parts welded irradiated by particle-beam generators to make them slightly radioactive. Used to verify predictions of computer codes for dynamics of fluids in weld pools.

B88-10502**MOLD FOR CASTING RADIUS-INSPECTION SPECIMENS**

ROBERT N. BALL (Rockwell International Corp.)

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29237

Vol. 12, No. 9, P. 88

Thin replicas viewed on comparator without sectioning. New mold machined from piece of transparent poly(methyl methacrylate). Fits around base of post. Two slots machined into inner surface form channels for casting inspection sections. Bottom of mold fits flush against surface around bottom of post. When surface slanted, mold automatically aligns in proper orientation. Time required to inspect elliptical radii located at bottoms of series of small posts reduced from 18 hours to 3 hours.

B88-10503**MAKING SMALLER MICROSHELLS FROM REFRACTORY METALS**

MARK C. LEE (Caltech), and CHRISTOPHER SCHILLING (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16635

Vol. 12, No. 9, P. 88

08 FABRICATION TECHNOLOGY

Tendency toward gas porosity exploited. Falling through drop tube, fine drops of molten metal lose heat to surroundings, forming hard shells around precipitated gas. Second heating/cooling cycle in drop tube of lower pressure lets gas expand. Process produces smaller shells in greater variety of materials than possible with such current processes as based on hollow-jet instability, dry-chemical blowing or fluid-droplet drying. Shell aspect ratio (ratio of radius to wall thickness) controllable. New process makes shells having diameters smaller than 100 micrometer. There are several candidate shell materials including refractory metals.

B88-10504

TOOL FOR TINNING INTEGRATED-CIRCUIT LEADS

GREGORY N. PROSSER (Martin Marietta Corp)

Oct. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21261 Vol. 12, No. 9, P. 89

As many as eight flatpacks held. Tool made of fiberglass boards. Clamps row of flatpacks by their leads so leads on opposite side of packages dipped. After dipping, nuts on boards loosened, flatpacks turned around, nuts retightened, and untinned leads dipped. Strips of magnetic material grip leads of flatpacks (made of Kovar, magnetic iron/nickel/cobalt alloy) while boards repositioned. Micrometerlike screw used to adjust exposed width of magnetic strip to suit dimensions of flatpacks. Holds flatpack integrated circuits so leads tinned. Accommodates several flatpacks for simultaneous dipping of leads in molten solder. Adjusts to accept flatpacks in range of sizes.

B88-10505

ANTIREFLECTION/PASSIVATION STEP FOR SILICON CELL

GERALD T. CROTTY (Caltech), AKARAM H. KACHARE (Caltech), and TAHER DAUD (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16810 Vol. 12, No. 9, P. 90

New process excludes usual silicon oxide passivation. Changes in principal electrical parameters during two kinds of processing suggest antireflection treatment almost as effective as oxide treatment in passivating cells. Does so without disadvantages of SiO_x passivation.

B88-10506

SEPARATING IMAGES FOR WELDING CONTROL

STEPHEN S. GORDON (Rockwell International Corp.)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29291 Vol. 12, No. 9, P. 91

Torch for automatic gas/tungsten-arc welding provides separate coaxial views of weld to two sensors. Each sensor functions in real time without interfering with other. One sensor provides information for vision-guided seam tracker; other feeds data to an optical weld-contour monitor for control penetration. Contains beam splitter at angle of 45 degree with electrode axis. Beam splitter reflects wavelengths below 550 nm to sensor for seam tracking. Transmits wavelengths above 550 nm to sensor for weld-contour monitoring. Filters added to split beam paths to limit further spectra transmitted to sensors. Beam splitter and filters easily changed to suit material and welding parameters.

B88-10546

SINE-BAR ATTACHMENT FOR MACHINE TOOLS

FRANKLIN D. MANN

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28253 Vol. 12, No. 10, P. 73

Sine-bar attachment for collets, spindles, and chucks helps machinists set up quickly for precise angular cuts that require greater precision than provided by graduations of machine tools. Machinist uses attachment to index head, carriage of milling machine or lathe relative to table or turning axis of tool. Attachment accurate to 1 minute or arc depending on length of sine bar and precision of gauge blocks in setup. Attachment installs quickly and easily on almost any type of lathe or mill. Requires no special clamps or fixtures, and eliminates many trial-and-error measurements. More stable than improvised setups and not jarred out of position readily.

B88-10547

UNIFORM ETCHING FOR POLYCRYSTALLINE

PHOTOCONDUCTOR FILMS

JOHN BARRETT (Itek Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12969 Vol. 12, No. 10, P. 74

Prewetting surface overcomes problem of nonuniformity of etching often occurring in polycrystalline films at PbS and PbSe. Believed prewetting causes etchant to attack film uniformly. Because process involves wet chemistry, inexpensive and easy to use.

B88-10548

PREFERRED SECONDARY CRYSTAL ORIENTATION FOR TURBINE BLADES

LESLIE G. FRITZEMEIER (Rockwell International Corp.), and JON D. FRANDSEN (Rockwell International Corp.)

Nov. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29253 Vol. 12, No. 10, P. 74

Directional solidification of single-crystal turbine blades, so secondary and primary, crystallographic orientation occurs on preferred axis, greatly increases resistance to fatigue. Technique lengthens lives of parts and reduces variation in longevity among parts.

B88-10549

STABILIZING SILICON-RIBBON GROWTH AT EARLY STAGES

PAUL K. HENRY (Caltech), and EDWARD P. FORTIER (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17074 Vol. 12, No. 10, P. 75

Device mechanically stabilizes buttons from which silicon ribbons grown by dendritic-web process. Eliminates tendency for button to tip and interrupt pull because of asymmetry. Silicon seed hangs from holder through stabilizing tube. While button growing, tube elevated above melt surface. When ready for pulling of ribbon, tube comes to rest on button and prevents tipping. Large button used. Even if button assumes highly-asymmetrical weight distribution in early stages of growth, little danger of tipping and breakage of nascent ribbon.

B88-10604

PROGRAMMABLE GRIT-BLASTING SYSTEM

RICHARD K. BURLEY (Rockwell International Corp.)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29220 Vol. 12, No. 11, P. 78

In programmable grit-blasting system undergoing design, controller moves blasting head to precise positions to shape or remove welding defects from parts. Controller holds head in position for preset dwell time and moves head to new position along

predetermined path. Position of articulated head established by pair of servomotors according to programmed signals from controller. Head similar to video borescope. Used to remove welding defects in blind holes. Suited for repetitive production operations in grit-blast box.

B88-10605**HOLDING IRREGULARLY SHAPED PARTS FOR MACHINING**

BURT W. HILTON (Rockwell International Corp.), and RICK R. WILSON (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29344**Vol. 12, No. 11, P. 78**

Part with complicated, irregular outside contours clamped for precise machining of internal passages with aid of simple method. Exterior of part cast in Rigidex, or equivalent epoxy. Forms wall to be clamped. Interior of part machined to finish of 125 microinches or finer. When machining finished, epoxy melted away by heating part to 200 degree F.

B88-10606**MONITORING WELDING-GAS QUALITY**

KEVIN L. HUDDLESTON (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29195**Vol. 12, No. 11, P. 79**

System monitors welding gas to ensure characteristics within predetermined values. Responds to changes that might go unnoticed by human operator and acts quickly to prevent weld defects. Electronic pressure controller employs various amounts of gain, equalization, and compensation to respond to changes in gas-supply pressure. Works in conjunction with pressure/oxygen/moisture monitor.

B88-10607**MACHINING THIN-WALLED CYLINDRICAL PARTS**

JOE CIMBAK (United Technologies Corp.), JIM SPAGNOLO (United Technologies Corp.), and DAN KRAUS (United Technologies Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21260**Vol. 12, No. 11, P. 79**

Cylindrical walls only few thousandths of inch thick machined accurately and without tears or punctures with aid of beryllium copper mandrel. Chilled so it contracts, then inserted in cylinder. As comes to room temperature, mandrel expands and fits snugly inside cylinder. Will not allow part to slide and provides solid backup to prevent deflection when part machined by grinding wheel. When machining finished, cylinder-and-mandrel assembly inserted in dry ice, mandrel contracts and removed from part.

B88-10608**TRANSLATING FURNACE FOR FAST MELTING AND FREEZING**

F. WORKMAN, R. J. SUGGS, P. A. CURRERI, E. C. ETHRIDGE, D. T. PERKINSON, S. TUCKER, and G. A. SMITH

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26064**Vol. 12, No. 11, P. 80**

Developmental translating-furnace apparatus used to make ceramic/metal composite materials during parabolic trajectories of KC-135 airplane simulating low gravity. Mathematical modeling shows apparatus able both to melt metal alloys and to solidify resulting composite specimens during 22-to-30-second low-gravity intervals. Furnace assembly moves along crucible in programmed manner to preheat, melt, and solidify specimen during interval to less than 22 second.

B88-10609**MAKING INTRICATE, THIN GASKETS**

WAYNE D. GEOUGE

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13681**Vol. 12, No. 11, P. 84**

Effective but inexpensive method developed for quickly fabricating intricate thin-film elastomeric seals for use in instrumentation manifolds. Uses aluminum stock and standard machine practices to prepare intricate thin-film seals quickly. Holes burned through gasket material with hot probes, using aluminum fixture for precise alignment.

B88-10610**SUBSTRATES FOR HIGH-TEMPERATURE SUPERCONDUCTORS**

PAUL J. SHLICHTA (Caltech)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17317**Vol. 12, No. 11, P. 84**

Proposed hot-dipping process prepares materials well suited to serve as substrates for high-temperature superconductors. Makes it possible to produce substrates combining properties needed for given application, such as flexibility, strength, long grains, and <001> crystal orientation. Properties favor growth of superconductive films carrying high current and fabricated in variety of useful shapes. Used in making solar cells, described in 'Hot-Dipped Metal Films as Epitaxial Substrates' (NPO-15904).

B88-10611**FATIGUE LIVES OF LASER-CUT METALS**

MICHAEL R. MARTIN (Mechanical Technology, Inc.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14682**Vol. 12, No. 11, P. 85**

Fatigue lives made to approach those attainable by traditional grinding methods. Fatigue-test specimens prepared from four metallic alloys, and material removed from specimens by manual grinding, by Nd:glass laser, and by Nd:YAG laser. Results of fatigue tests of all specimens indicated reduction of fatigue strengths of laser-fired specimens. Laser machining holds promise for improved balancing of components of gas turbines.

B88-10612**STABLE AND OSCILLATING ACOUSTIC LEVITATION**

MARTIN B. BARMATZ (Caltech), and STEVEN L. GARRETT (Naval Postgraduate School)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16896**Vol. 12, No. 11, P. 86**

Sample stability or instability determined by levitating frequency. Degree of oscillation of acoustically levitated object along axis of levitation chamber controlled by varying frequency of acoustic driver for axis above or below frequency of corresponding chamber resonance. Stabilization/oscillation technique applied in normal Earth gravity, or in absence of gravity to bring object quickly to rest at nominal levitation position or make object oscillate in desired range about that position.

B88-10613**DIMPLING TOOLS WOULD FORM FASTENER NEATLY**

MICHAEL D. ROBERTS (Rockwell International Corp.), and DONALD R. HENDRICKSON (Rockwell International Corp.)

Dec. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29306**Vol. 12, No. 11, P. 88**

08 FABRICATION TECHNOLOGY

Proposed set of tools neatly dimple cup washer to prevent screw from turning in mounting hole. Two dimples required, one leaning outward to grip recess in mounting hole and one leaning inward to grip recess in screw-head. Tools do not cause cracks and tears. Substitute die-forming process for hammer-and-center-punch process. De-forming process requires less skill and gives results of greater quality and consistency.

B88-10614

VIBRATIONS WOULD INDUCE FLOW IN MOLTEN SILICON

M.B. BARMATZ (Caltech), and A.D. MORRISON (Caltech)
Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17087

Vol. 12, No. 11, P. 89

Flow patterns and velocities controlled to improve crystals. According to proposal, intense sound used to induce flow in molten silicon to increase quality of crystals grown in shallow-melt Czochralski process.

B89-10034

PHOTOPOLYMERIZATION OF LEVITATED DROPLETS

ALAN REMBAUM (Caltech), WON-KYU RHIM (Caltech), MICHAEL T. HYSOON (Caltech), and MANCHIUM CHANG (Caltech)
Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16551

Vol. 13, No. 1, P. 78

Experimental containerless process combines two established techniques to make variety of polymeric microspheres. In single step, electrostatically-levitated monomer droplets polymerized by ultraviolet light. Faster than multiple-step emulsion polymerization process used to make microspheres. Droplets suspended in cylindrical quadrupole electrostatic levitator. Alternating electrostatic field produces dynamic potential along axis. Process enables tailoring of microspheres for medical, scientific, and industrial applications.

B89-10035

SEMIEMPIRICAL MODEL WOULD CONTROL CZOCHRALSKI PROCESS

M. P. DUDUKOVIC (Washington University), P. A. RAMACHANDRAN (Washington University), and R. K. SRIVASTAVA (Washington University)
Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17271

Vol. 13, No. 1, P. 79

Semiempirical mathematical model proposed for control of growth of single crystals of silicon by Czochralski process. Expresses dependence of pulling rate and shape of liquid/solid interface upon important process variables; radius of growing crystal, temperature of crucible, level of melt, and height of exposed portion of crucible wall. Necessary to control shape of interface in manner consistent with other variables, to maintain radially uniform concentration of dopant, and reduce thermally induced stresses in vicinity of interface. Used to simulate complete growth cycles without requiring excessive computer time consumed by rigorous finite-element modeling.

B89-10036

GAS-JET COOLING WOULD IMPROVE CZOCHRALSKI PROCESS

M. P. DUDUKOVIC (Washington University), P. A. RAMACHANDRAN (Washington University), and R. K. SRIVASTAVA (Washington University)
Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-17272

Vol. 13, No. 1, P. 79

Controlled cooling by jets of gas improves growth of single crystals of silicon by Czochralski process, according to study. Rate of cooling by jets joins temperature of crucible and pulling rate as input variable of process adjusted to achieve required diameter of crystal and shape of crystal/melt interface. Critical parameters of growing crystal, output variables of Czochralski process controlled via two or all three of input variables. One input variable, usually speed, held constant while other two adjusted to achieve required diameter and interface.

B89-10037

GRINDING PARTS FOR AUTOMATIC WELDING

RICHARD K. BURLEY (Rockwell International Corp.), and WILLIAM S. HOULT (Rockwell International Corp.)

Jan. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29329

Vol. 13, No. 1, P. 80

Rollers guide grinding tool along prospective welding path. Skatelike fixture holds rotary grinder or file for machining large-diameter rings or ring segments in preparation for welding. Operator grasps handles to push rolling fixture along part. Rollers maintain precise dimensional relationship so grinding wheel cuts precise depth. Fixture-mounted grinder machines surface to quality sufficient for automatic welding; manual welding with attendant variations and distortion not necessary. Developed to enable automatic welding of parts, manual welding of which resulted in weld bead permeated with microscopic fissures.

B89-10072

UNIFIED ENGINEERING SOFTWARE SYSTEM

L. R. PURVES, S. GORDON, A. PELTZMAN, and M. DUBE

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12900

Vol. 13, No. 2, P. 64

Collection of computer programs performs diverse functions in prototype engineering. NEXUS, NASA Engineering Extendible Unified Software system, is research set of computer programs designed to support full sequence of activities encountered in NASA engineering projects. Sequence spans preliminary design, design analysis, detailed design, manufacturing, assembly, and testing. Primarily addresses process of prototype engineering, task of getting single or small number of copies of product to work. Written in FORTRAN 77 and PROLOG.

B89-10091

THREE-DIMENSIONAL COAXIAL WELD MONITORING

STEPHEN S. GORDON (Rockwell International Corp.)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29373

Vol. 13, No. 2, P. 86

Optical system for coaxial-viewing welding torch enables perception or measurement of depth. Light from welding area passes through beam splitter into two optical trains forming two images, each viewed along line making small angle with axis of torch. Two lines of sight intersect at weld pool. Parallax between two views provides sensation of depth over entire field view.

B89-10092

IMPROVED METHOD FOR MAKING INFRARED IMAGERS

G. KAGANOWICZ (David Sarnoff Research Center), A. G. MOLDOVAN (David Sarnoff Research Center), and J. W. ROBINSON (David Sarnoff Research Center)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

GSC-13135

Vol. 13, No. 2, P. 86

Properties of thin dielectric layer adjusted precisely. Deposition technique found to improve fabrication of infrared imaging devices. Applied to dielectric layer of SiO and SiO₂, critical to operation of device. For imager to work properly, thickness of dielectric layer adjusted precisely in coordination with absorption coefficient and wavelength of light imaged. New deposition process enables adjustment of thickness and index of refraction of critical dielectric layer to within plus or minus 1 percent.

B89-10093**CANNING OF POWDERED METAL FOR HOT ISOSTATIC PRESSING**

JOHN J. JUHAS

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14719**Vol. 13, No. 2, P. 87**

Quality of specimen enhanced by improved canning process. Method developed for canning specimens for hot isostatic pressing. Specimen placed inside refractory-metal ring, then sandwiched between two refractory-metal face sheets. Assembly placed inside die, then positioned in vacuum hot press. Heated to set temperature at prescribed vacuum to burn off all of binder in specimen. Advantages: powder-metallurgy composite totally purged of binder sealed in can in single operation, maintains size, shape, and uniformity of specimen. Weld region does not recrystallize, and little possibility of cracking.

B89-10094**PLATING PATCHES ON HEAT-EXCHANGER JACKETS**

HENRY LOUREIRO (Rockwell International Corp.), and FRANK KUBIK (Rockwell International Corp.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29345**Vol. 13, No. 2, P. 88**

Permanent repairs made without welding. Technique used to repair nickel-alloy nozzle jacket of Space Shuttle main engine. Applicable to other metal heat-exchanger jackets with similar configurations. Does not require welding, brazing, soldering, or other operations involving high temperatures and consequent damage to surrounding areas. Portion of jacket around damaged area removed by grinding and polishing out to edges adjacent to tube/jacket braze bonds. Spaces between tubes filled with wax preventing contamination of spaces during subsequent plating.

B89-10095**BENDABLE EXTENSION FOR ABRASIVE-JET CLEANING**

WALTER MAYER (Rockwell International)

Feb. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29298**Vol. 13, No. 2, P. 88**

Hard-to-reach places cleaned more easily. Extension for abrasive-jet apparatus bent to provide controlled abrasive cleaning of walls in deep cavities or other hard-to-reach places. Designed for controlled removal of penetrant inspection dyes from inside castings, extension tube also used for such general grit-blasting work as removal of scratches.

B89-10096**MAKING AND INSPECTING LARGE WIRE GRIDS**

THOMAS J. MAGNER, RICHARD D. BARNEY, WILLIAM L. EICHHORN, and HENRY P. SAMPLER

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13117**Vol. 13, No. 2, P. 89**

Old techniques refined and combined to make new polarizers. Equipment and procedures developed for fabrication and inspection

of large, precisely-spaced, flat grids of wire. Technology includes refinements and combinations of established techniques for winding grids of electron tubes and ruling optical gratings and incorporates recent developments in electronic control and laser/electronic-based metrology. Wire wrapped on frame half translated under automatic control to achieve desired space between turns. Frame halves put together, and excess wire cut away, leaving finished grid mounted in frame. Useful as polarizers and beam splitters for electromagnetic radiation in overlapping ranges of long infrared and microwaves.

B89-10145**ENDJOINTS FOR STRUCTURAL ELEMENTS**

HAROLD G. BUSH, MARTIN M. MIKULAS, and RICHARD E. WALLSOM (PRC Kentron, Inc.)

Mar. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13584**Vol. 13, No. 3, P. 81**

Endjoint and connecting-node system designed for use in erection of frames. System structurally sound and simple to operate. All nodes and struts interchangeable. Nodes and struts attach to form cubic cell structures to produce beams, platforms, towers, or combinations of these. Design suitable for use in construction of space structures and such terrestrial skeletal frameworks as antenna-reflector supports, roof structures for large buildings, lookout towers, radio-transmitter towers, powerline pylons, and scaffolds.

B89-10146**ULTRACLEAN RADIANT FURNACE**

DAVID W. BLAIR (Princeton Scientific Enterprises)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26070**Vol. 13, No. 3, P. 81**

Relatively-inexpensive radiant furnace brings specimen in controlled atmosphere to temperature higher than previously attainable - nearly as high as maximum operating temperature of heating element. Heating element made of refractory material like tungsten, molybdenum, graphite, or silicon carbide, or consists of plasma or electric arcs. Furnace distributes heat fairly uniformly over surface of specimen.

B89-10147**NONDESTRUCTIVE INSPECTION OF FOAM AND MULTILAYER INSULATIONS**

DENNIS R. KRAUSE (Spectron Development Labs., Inc.), ROBERT J. BAUMAN (Spectron Development Labs., Inc.), and THOMAS J. DAVIS (Spectron Development Labs., Inc.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27199**Vol. 13, No. 3, P. 82**

Techniques and equipment enable nondestructive inspection of sprayed-on foam and multilayer reflecting thermal insulations on metallic substrates. Technology is applied in factories and laboratories; to inspect insulation on cryogenic tanks and pipes. Equipment includes probe head, several electronic modules that take measurements via electromagnetic and electrostatic sensors in probe head, small computer to store and process signals from modules, and printer.

B89-10148**PLATING REPAIR OF NICKEL-ALLOY PRESSURE VESSELS**

STEVE K. RICKLEFS (Rockwell International Corp.), and KEVIN M. CHAGNON (Rockwell International Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

08 FABRICATION TECHNOLOGY

MD. 21240-0757

MFS-29304

Vol. 13, No. 3, P. 85

Procedure for localized electrodeposition of nickel enables repair of small damaged nickel-based pressure vessels. Electrodeposition restores weakened areas of vessel wall to at least their former strength.

B89-10149

COMPACT RIGHT-ANGLE CONNECTOR

SALVADOR L. BARAJAS (Rockwell International Corp.), and VONDE E. PIERSON (Rockwell International Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20697

Vol. 13, No. 3, P. 86

New right-angle connector between hose and 'quick-disconnect' coupler smaller and simpler than its predecessor. Employs fewer parts and therefore cheaper and less likely to leak. Connector consists of only two major parts.

B89-10204

THERMALLY STABLE TRUSS

A. M. NOWITZKY (DWA Composite Specialties, Inc.), and E. C. SUPAN (DWA Composite Specialties, Inc.)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27216

Vol. 13, No. 4, P. 107

Lightweight truss made of materials that yield low thermal expansion and contraction. Average coefficient of thermal expansion minus 0.0428 part per million per degree Fahrenheit (0.0770 ppm/degree C) between minus 100 and plus 150 degree F (minus 73 and plus 66 degree C). Rotational distortion of truss less than 1/4 degree as temperature is varied through same range. High thermal conductivity minimizes temperature gradients, minimizing thermal distortions under variety of heating and cooling conditions. Elements of truss readily assembled.

B89-10205

SPINNER FOR ETCHING OF SEMICONDUCTOR WAFERS

FRANK LOMBARDI (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16912

Vol. 13, No. 4, P. 108

Simple, inexpensive apparatus coats semiconductor wafers uniformly with hydrofluoric acid for etching. Apparatus made in part from small commercial electric-fan motor. Features bowl that collects acid. Silicon wafer placed on platform and centered on axis; motor switched on. As wafer spins, drops of hydrofluoric acid applied from syringe. Centrifugal force spreads acid across wafer in fairly uniform sheet.

B89-10206

CERAMIC HONEYCOMB PANELS

DOMENICK E. CAGLIOSTRO, and SALVATORE R. RICCIETIELLO

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11652

Vol. 13, No. 4, P. 108

Ceramic honeycomb panels serve as lightweight, heat-resistant structural members. Depending on choice of ceramic materials, panels expected to withstand temperatures as high as 1,800 degree C. Honeycomb structure made by vapor-depositing ceramic on fabric substrate woven in honeycomb pattern, then eliminating substrate by oxidizing it. Fabric made of loosely woven polymer such as polyacrylonitrile. Impregnated with organic binder such as phenolic resin for stiffness.

B89-10207

FABRICATION OF FIBER-OPTIC WAVEGUIDE COUPLER

WILLIS GOSS (Caltech), MARK D. NELSON (Caltech), and JOHN M. MCCLAUCHLAN (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-15630

Vol. 13, No. 4, P. 109

Technique for making four-port, single-mode fiber-optic waveguide couplers requires no critically-precise fabrication operations or open-loop processes. Waveguide couplers analogous to beam-splitter prisms. Essential in many applications that require coherent separation or combination of two waves; for example, for interferometric purposes. Components of optical waveguide coupler held by paraffin on microscope slide while remaining cladding of two optical fibers fused together by arc welding.

B89-10208

ANNEALING INCREASES STABILITY OF IRIIDIUM THERMOCOUPLES

EDWARD F. GERMAIN, KAMRAN DARYABEIGI, DAVID W. ALDERFER, ROBERT E. WRIGHT, and SHAFFIQ AHMED (Youngstown State Univ.)

Apr. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17018)

LAR-13951

Vol. 13, No. 4, P. 110

Metallurgical studies carried out on samples of iridium versus iridium/40-percent rhodium thermocouples in condition received from manufacturer. Metallurgical studies included x-ray, macroscopic, resistance, and metallographic studies. Revealed large amount of internal stress caused by cold-working during manufacturing, and large number of segregations and inhomogeneities. Samples annealed in furnace at temperatures from 1,000 to 2,000 degree C for intervals up to 1 h to study effects of heat treatment. Wire annealed by this procedure found to be ductile.

B89-10257

PORTABLE PULL TESTER

HARRY E. GOLDEN (Martin Marietta Corp.), and HENRY E. PHILLIPS (Martin Marietta Corp.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28302

Vol. 13, No. 5, P. 81

In new tester, dc motor controlled by personal computer drives lead screw. Lead screw attached to load cell and to test button bonded to specimen of material under test. Data examined on computer screen, printed out, or transmitted to larger computer for analysis. Monitors speed of motor to maintain it constant, provides constant rate of pull. Cart holds computer, printer, and motor-driving circuits so moved easily to test site.

B89-10258

PROGRAMMABLE POSITIONER FOR SPOT WELDING

WILLIAM A. RODEN (General Dynamics Corp.)

May 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14622

Vol. 13, No. 5, P. 82

Welding station mechanized by installing preset indexing system and gear drive. Mechanism includes a low-cost, versatile, single-axis motion control and motor drive to provide fully-automatic weld sequencing and spot-to-spot spacing. Welding station relieves operator of some difficult, tedious tasks and increases both productivity and quality of welds. Results in welds of higher quality and greater accuracy, fewer weld defects, and faster welding operation.

B89-10259**LASER/PLASMA/CHEMICAL-VAPOR DEPOSITION OF DIAMOND**

GEORGE C. HSU (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17487**Vol. 13, No. 5, P. 82**

Proposed process for deposition of diamond films includes combination of plasma induced in hydrocarbon feed gas by microwave radiation and irradiation of plasma and substrate by lasers. Deposition of graphite suppressed. Reaction chamber irradiated at wavelength favoring polymerization of CH₂ radical into powders filtered out of gas. CH₃ radicals, having desired sp³ configuration, remains in gas to serve as precursors for deposition. Feed gas selected to favor formation of CH₃ radicals; candidates include CH₄, C₂H₄, C₂H₂, and C₂H₆. Plasma produced by applying sufficient power at frequency of 2.45 GHz and adjusting density of gas to obtain electron kinetic energies around 100 eV in low-pressure, low-temperature regime.

B89-10260**LASER-ASSISTED GROWTH OF ALGAS FILMS**

JOSEPH D. WARNER, DAVID M. WILT, JOHN J. POUCH, and PAUL R. ARON

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-23304)

LEW-14638**Vol. 13, No. 5, P. 83**

Films of aluminum gallium arsenide grown on gallium arsenide by laser-assisted organometallic chemical-vapor deposition. Films single-crystal and contain no detectable oxygen or carbon. Laser beam impinges on substrate in quartz reaction chamber surrounded by radio-frequency induction coils. Film grows much more rapidly at 500 degree C than 450 degree C. Slight amount of interfacial oxygen detectable in film deposited at lower temperature.

B89-10261**PLASMA/NEUTRAL-BEAM ETCHING APPARATUS**

WILLIAM LANGER (Princeton Univ.), SAMUEL COHEN (Princeton Univ.), JOHN CUTHBERTSON (Princeton Univ.), DENNIS MANOS (Princeton Univ.), and ROBERT MOTLEY (Princeton Univ.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26068**Vol. 13, No. 5, P. 83**

Energies of neutral particles controllable. Apparatus developed to produce intense beams of reactant atoms for simulating low-Earth-orbit oxygen erosion, for studying beam-gas collisions, and for etching semiconductor substrates. Neutral beam formed by neutralization and reflection of accelerated plasma on metal plate. Plasma ejected from coaxial plasma gun toward neutralizing plate, where turned into beam of atoms or molecules and aimed at substrate to be etched.

B89-10262**APPARATUS IMPREGNATES WEAK FIBERS**

CLARENCE E. STANFIELD, and MAYWOOD L. WILSON

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13603**Vol. 13, No. 5, P. 84**

Low-cost apparatus developed for use in conventional drum winding machine to impregnate fibrous materials having very low tensile strengths. Fiber fitted onto freely-spinning unwinding creel. Unwinds from creel between two tension bars onto guide spools, aligns fiber so properly enters sealed reservoir of resin. Stainless-steel metering die at entrance to reservoir aligns fiber and seals reservoir. Beneficial results obtained by use of reservoir made of polyethylene. Composite material made from resin matrices reinforced by fibers have great potential for solving challenging

and often critical problems in design of spacecraft, space structures, and terrestrial structures.

B89-10263**SIMPLIFIED ROTATION IN ACOUSTIC LEVITATION**

M. B. BARMATZ (Caltech), M. S. GASPAR (Caltech), and E. H. TRINH (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17086**Vol. 13, No. 5, P. 85**

New technique based on old discovery used to control orientation of object levitated acoustically in axisymmetric chamber. Method does not require expensive equipment like additional acoustic drivers of precisely adjustable amplitude, phase, and frequency. Reflecting object acts as second source of sound. If reflecting object large enough, close enough to levitated object, or focuses reflected sound sufficiently, Rayleigh torque exerted on levitated object by reflected sound controls orientation of object.

B89-10264**ROUGHENING SURFACES OF SOLAR CELLS**

RANBIR SINGH (Pennsylvania State Univ.), and S. J. FONASH (Pennsylvania State Univ.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17295**Vol. 13, No. 5, P. 85**

Proposed treatment involving bombardment by ions gives silicon solar cells rough surfaces and increases amount of light absorbed by cells. First step of treatment, wafer of single-crystal silicon held at temperature of 70 degree C or higher while bombarded with argon or hydrogen ions at kinetic energies between 100 and 2,000 eV. This high dose produces damaged layer on surface, consisting of outer polycrystalline sublayer and underlying sublayer containing extended defects. Bombarded wafer then etched chemically. Photovoltaic conversion efficiency increases with number of reflections at surface of silicon cell because large part of light absorbed at each reflection. Deeply textured surface provides opportunities for multiple reflections.

B89-10265**ORIENTING SUPERCONDUCTIVE CRYSTALS FOR HIGH CURRENT DENSITY**

PAUL J. SHLICHTA (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17330**Vol. 13, No. 5, P. 86**

Proposed technique for controlled distortion of crystal grains in newly discovered superconductor YBa₂Cu₃O_{7-x} increases current-carrying capacity. Helps to ensure grains in this and other anisotropic materials all oriented in same direction so charge carriers transferred readily from one grain to another. Specimen of YBa₂Cu₃O_{7-x} heated in oxygen atmosphere compressed in one direction as slowly cooled below transition temperature. Under these conditions, oxygen atoms tend to rearrange so as to relieve stress created by compression.

B89-10266**APPLYING ELASTOMERIC INSULATION INSIDE A ROUND CASE**

PETER G. RUSSELL (Morton Thiokol, Inc.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28286**Vol. 13, No. 5, P. 87**

Elastomer wound onto inside surface in continuous strip.

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Technique being developed to apply elastomeric insulation to inner surfaces of axisymmetric cases. Requires modification of machine wrapping strip of elastomer on outside of rotating mandrel. Intended for coating insides of rocket-motor cases, technique also used to install elastomeric linings in pressure vessels, containers for chemical, and environmental chambers.

B89-10267

VARIABLE-ENERGY ION BEAMS FOR MODIFICATION OF SURFACES

ARA CHUTJIAN (Caltech), MICHAEL H. HECHT (Caltech), and OTTO J. ORIENT (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17498

Vol. 13, No. 5, P. 88

Beam of low-energy negative oxygen ions used to grow layer of silicon dioxide on silicon. Beam unique both in purity, contains no molecular oxygen or other charged species, and in low energy, which is insufficient to damage silicon by physically displacing atoms. Low-energy growth accomplished with help of ion-beam apparatus. Directs electrons into crosswise stream of gas, generating stream of negative ions. Pair of charged plates separates ions from accompanying electrons and diverts ion beam to target - silicon substrate. Diameter of beam at target 0.5 to 0.75 cm. Promises useful device to study oxidation of semiconductors and, in certain applications, to replace conventional oxidation processes.

B89-10319

STRONG, LOW-RESISTANCE BONDS FOR AMTEC ELECTRODES

ROGER M. WILLIAMS (Caltech), BOB L. WHEELER (Caltech), BARBARA JEFFRIES-NAKAMURA (Caltech), C. PERRY BANKSTON (Caltech), TERRY COLE (Caltech), and MARIA LOVELAND (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17161

Vol. 13, No. 6, P. 86

Heat of operating cell helps form contacts. Strong, low-electrical-resistance contacts between elements of current-collection grid in alkali-metal thermoelectric converter (AMTEC) cell obtained by simple in-place thermocompression bonding. Bonds formed between porous electrode of molybdenum film, nickel or cobalt strips overlying film, and molybdenum tie wires running at right angles to strips. Bonding method also works on films of tungsten or tungsten/platinum.

B89-10320

IMPROVED VACUUM-TIGHT CONNECTOR

FRANK RUDIN

Jun. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14720

Vol. 13, No. 6, P. 86

Simple reinforcing tube increases service life and improves seal. Short stainless-steel tube inserted in copper tube to reinforce against compression, preventing leaks due to thermal distortion or to collapse under squeeze of ferrule in compressure fitting. Several test specimens of improved connector constructed, tested, and evaluated. Fittings not only operated successfully at required operating conditions of vacuum and temperature but also consistently demonstrated high reliability after loosened and tightened many times.

B89-10321

ELECTROSTATIC SPRAYING WITH CONDUCTIVE LIQUIDS

JOSEPH J. KOSMO, FREDERIC S. DAWN, ROBERT E.

ERLANDSON (Albany International Research Co.), and LOREN E. ATKINS (Albany International Research Co.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21067

Vol. 13, No. 6, P. 88

Thin, uniform polymer coatings applied in water base normally impossible to charge. Electrostatic sprayer modified so applies coatings suspended or dissolved in electrically conductive liquids. Nozzle and gun constructed of nonconductive molded plastic. Liquid passageway made long enough electrical leakage through it low. Coaxial hose for liquid built of polytetrafluoroethylene tube, insulating sleeve, and polyurethane jacket. Sprayer provided with insulated seal at gun-to-hose connection, nonconductive airhose, pressure tank electrically isolated from ground, and special nozzle electrode. Supply of atomizing air reduced so particle momentum controlled by electrostatic field more effectively. Developed to apply water-base polyurethane coating to woven, shaped polyester fabric. Coating provides pressure seal for fabric, which is part of spacesuit. Also useful for applying waterproof, decorative, or protective coatings to fabrics for use on Earth.

B89-10322

DIFFERENTIAL CURING IN FIBER/RESIN LAMINATES

CHARLES N. WEBSTER (LTV Missiles and Electronics Group)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21376

Vol. 13, No. 6, P. 89

Modified layup schedule counteracts tendency toward delamination. Improved manufacturing process resembles conventional process, except prepregs partially cured laid on mold in sequence in degree of partial cure decreases from mold side to bag side. Degree of partial cure of each layer at time of layup selected by controlling storage and partial-curing temperatures of prepreg according to Arrhenius equation for rate of gel of resin as function of temperature and time from moment of mixing. Differential advancement of cure in layers made large enough to offset effect of advance bag-side heating in oven or autoclave. Technique helps prevent entrapment of volatile materials during manufacturing of fiber/resin laminates.

B89-10323

ATTACHING PRECISE MIRRORS TO LIGHTWEIGHT SUPPORTS

ADEN B. MEINEL (Caltech), and MARJORIE P. MEINEL (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17164

Vol. 13, No. 6, P. 90

Mirrors formed on optical masters and glued in place. Technique forms precise mirror surfaces on lightweight, rigid, imprecise graphite-composite substrates. Resembles that used to make lightweight replica mirrors and gratings. Layer of parting material deposited on master optical surface of precise desired shape. Parting layer must be very thin to minimize degradation of replica. Enables fabrication of lightweight mirrors of high surface finish suitable for use at short wavelengths.

B89-10324

MAKING A SUPERCONDUCTIVE THIN FILM

MAW-KUEN WU (University of Alabama)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26093

Vol. 13, No. 6, P. 90

Experimental fabrication process results in superconductive thin film of YBa₂Cu₃O₇ ('123' phase of Y/Ba/Cu/O) on substrate of green semiconducting Y₂BaCuO₅ (the '211' phase). Film becomes

superconductive below transition temperature (T_c) of 93 K. Superconducting material to be deposited on substrate. Material then annealed in oxygen at 950 degree C for 6 h, followed by slow cooling in furnace. At this point, material had a T_c of 96 K. Transition to superconductivity at 93 K very sharp. Estimated critical current density 350 A/cm².

B89-10325**ADVANCED ENGRAVING OF ANGLE-ENCODER DISKS**

WALTER K. POLSTORFF

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28294

Vol. 13, No. 6, P. 93

Precision increased over mechanical engravers. Laser pulses timed according to rotational speed of rotor electrostatically suspended in vacuum marks angular-encoder disk mounted on lower end of rotor. Precision of timing circuitry and low rotational damping (damping time about 700 years in high vacuum) results in highly-precise angular intervals. System conceived to meet need for increased precision of angular measurements in advanced scientific instruments.

B89-10326**PROCESS FOR PATTERNING DISPENSER-CATHODE SURFACES**

CHARLES E. GARNER (Caltech), and WILLIAM D. DEININGER (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17183

Vol. 13, No. 6, P. 94

Several microfabrication techniques combined into process cutting slots 100 micrometer long and 1 to 5 micrometer wide into tungsten dispenser cathodes for traveling-wave tubes. Patterned photoresist serves as mask for etching underlying aluminum. Chemically-assisted ion-beam etching with chlorine removes exposed parts of aluminum layer. Etching with fluorine or chlorine trifluoride removes tungsten not masked by aluminum layer. Slots enable more-uniform low-work function coating dispensed to electron-emitting surface. Emission of electrons therefore becomes more uniform over cathode surface.

B89-10327**DEPOSITION OF PINHOLE-FREE COSI₂ FILM**

TRUE-LON LIN (Caltech), ROBERT N. FATHAUER (Caltech), and PAULA J. GRUNTHANER (Caltech)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17447

Vol. 13, No. 6, P. 95

New fabrication method produces pinhole-free film of cobalt silicide on silicon substrate. In new method, cobalt and silicon evaporated from electron-beam sources onto substrate of silicon having <111> crystal orientation. Materials deposited in stoichiometric ratio of two silicon atoms to one of cobalt, yielding single-crystal CoSi₂ film 5 to 10 nm thick. Layer of amorphous silicon 1 to 2 nm thick deposited on CoSi₂. Specimen then annealed at 550 degree C for 10 min. Absence of pinholes critical to operation of multilayer devices employing CoSi₂ layers, such as metal base transistor.

B89-10328**FLUIDIZED-BED REACTOR WITH ZONE HEATING**

SRIDHAR K. IYA (Union Carbide Corp.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17470

Vol. 13, No. 6, P. 96

Deposition of silicon on wall suppressed. In new fluidized bed, silicon seed particles heated in uppermost zone of reactor. Hot particles gradually mix with lower particles and descend through fluidized bed. Lower wall of vessel kept relatively cool. Because silane enters at bottom and circulates through reactor pyrolyzed to silicon at high temperatures, silicon deposited on particles in preference wall. Design of fluidized bed for production of silicon greatly reduces tendency of silicon to deposit on wall of reaction vessel.

B89-10329**MOLECULAR-BEAM EPITAXY OF CRSI₂ ON SI(111)**

ROBERT W. FATHAUER (Caltech), PAULA J. GRUNTHANER (Caltech), TRUE-LON LIN (Caltech), DAVID N. JAMIESON (Caltech), and JUREK H. MAZUR (University of Southern California)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17438

Vol. 13, No. 6, P. 97

Crystalline layers grown in commercial apparatus. Experiments show CrSi₂ grown on (111) face of single-crystal Si substrate by molecular-beam epitaxy. Epitaxial CrSi₂ produced thus far not in desired single-crystal form. Because CrSi₂ semiconductor with band gap of 0.3 eV, experimental process potential for monolithic integration of microelectronic devices based on CrSi₂ (e.g., infrared detectors) with signal-processing circuitry based on Si.

B89-10378**CHEMICAL-VAPOR DEPOSITION OF CD₁-XMNXTE**

AKBAR NOUHI (Caltech), and RICHARD J. STIRN (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17399

Vol. 13, No. 7, P. 76

Experimental process makes films with interesting magnetic and magneto-optical properties. Films of dilute magnetic semiconductor alloy Cd_{1-x}MnxTe deposited on glass and GaAs substrates by metalorganic chemical-vapor deposition (MOCVD). Devices made with Cd_{1-x}MnxTe films known to exhibit strong photoluminescence, stimulated emission, and magnetically-tunable lasing action. In addition, energy-band gaps of such material tailored by altering its composition - property giving flexibility in development of high-efficiency cascade solar photovoltaic cells. Performs at atmospheric pressure, resulting in more-uniform films, covering larger area, and enabling higher production rate.

B89-10379**MAKING A PRECISELY LEVEL FLOOR**

WILLIAM G. SIMPSON, WILLIAM H. WALKER, JIM CATHER, JOHN B. BURCH, KEITH M. CLARK, DWIGHT JOHNSTON, and DAVID E. HENDERSON (Sperry Rand Corp.)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28306

Vol. 13, No. 7, P. 78

Floor-pouring procedure yields large surface level, smooth, and hard. Floor made of self-leveling, slow-curing epoxy with added black pigment. Epoxy poured to thickness no greater than 0.33 in. (0.84 cm) on concrete base. Base floor seasoned, reasonably smooth and level, and at least 4 in. (10cm) thick. Base rests on thermal barrier of gravel or cinders and contains no steel plates, dividers, or bridges to minimize thermal distortion. Metal retaining wall surrounds base.

B89-10380**MAKING MULTICORE, MULTISHELL MICROSPHERES**

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ANDREW D. MORRISON (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17203

Vol. 13, No. 7, P. 80

Multiple streams of fluids combined to produce various structures. Spherical or nearly spherical micro-shells containing two or more discrete inclusions produced by proposed technique. Pairs of coaxial nozzles combined in arrays of two or more. Each pair of nozzles generate inner jet surrounded by sheath of fluid. Multiple jets combined to form droplets composed of shells and cores. Spheres designed so cores combine to mix or react only after leaving shell generator. Similarly, two or more shell-wall materials mix or react after leaving generator.

B89-10381

CIRCULARITY-MEASURING SYSTEM

WHIPPO, WALTER B. (Morton Thiokol, Inc.), G. R. ROHRKASTE (Morton Thiokol, Inc.), and JOHN E. MILLER (Morton Thiokol, Inc.)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28313

Vol. 13, No. 7, P. 83

Shape gauge and associated computer constitute system measuring deviations of large cylinders from roundness. Shaped and held somewhat like crossbow, measures relative locations of three points on surface of large, round object. By making connected series of measurements around periphery technician using gauge determines deviation of object from perfect circularity. Used to measure straightness, roundness, or complicated shapes of such large geometrical objects as surfaces of aircraft and hulls of ships.

B89-10382

KEEPING WAX LIQUID FOR APPLICATION

RUSSELL V. MEYER (Rockwell International Corp.)

Jul. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29238

Vol. 13, No. 7, P. 84

'Hot gun' applies masking wax and similar materials in liquid state. Holding chamber and nozzle supply continuous heat to wax, and wax injects directly into hole as liquid. Nozzles of various sizes interchange so one selects nozzle having opening suited to viscosity of wax and size of hole in particular application. Gun fast, eliminates repeated application, and greatly reduces cleanup time. Available commercially for applying hot glue, used to ensure wax penetrates and fills holes, flow passages, and manifold passages so contamination sealed off during manufacturing operations.

B89-10418

BAFFLES PROMOTE WIDER, THINNER SILICON RIBBONS

RAYMOND G. SEIDENSTICKER (Westinghouse Electric Corp.), JAMES P. MCHUGH (Westinghouse Electric Corp.), ROLV HUNDAL (Westinghouse Electric Corp.), and RICHARD P. SPRECAVE (Westinghouse Electric Corp.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17168

Vol. 13, No. 8, P. 78

Set of baffles just below exit duct of silicon-ribbon-growing furnace reduces thermal stresses in ribbons so wider ribbons grown. Productivity of furnace increased. Diverts plume of hot gas from ribbon and allows cooler gas from top of furnace to flow around. Also shields ribbon from thermal radiation from hot growth assembly. Ribbon cooled to lower temperature before reaching cooler exit duct, avoiding abrupt drop in temperature as entering duct.

B89-10419

CALCULATING OBSCURATION RATIOS OF CONTAMINATED SURFACES

JACK B. BARENGOLTZ (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17376

Vol. 13, No. 8, P. 78

Equations derived to estimate obscuration ratios of surfaces contaminated by particles. Ratio is fraction of surface area covered by particles. Useful as index of cleanliness in clean-room operations in manufacturing of semiconductor devices, magnetic recording media, optical devices, and pharmaceutical and biotechnological products.

B89-10420

FORGING LONG SHAFTS ON DISKS

CHRIS TILGHMAN (United Technologies Corp.), WILLIAM ASKEY (United Technologies Corp.), and STEVEN HOPKINS (United Technologies Corp.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28288

Vol. 13, No. 8, P. 79

Isothermal-forging apparatus produces long shafts integral with disks. Equipment based on modification of conventional isothermal-forging equipment, required stroke cut by more than half. Enables forging of shafts as long as 48 in. (122 cm) on typical modified conventional forging press, otherwise limited to making shafts no longer than 18 in. (46cm). Removable punch, in which forged material cools after plastic deformation, essential novel feature of forging apparatus. Technology used to improve such products as components of gas turbines and turbopumps and of other shaft/disk parts for powerplants, drive trains, or static structures.

B89-10421

DETERMINING EQUILIBRIUM POSITION FOR ACOUSTICAL LEVITATION

M. B. BARMATZ (Caltech), G. AVENI (Caltech), S. PUTTERMAN (California State Univ., Los Angeles), and J. RUDNICK (California State Univ., Los Angeles)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17511

Vol. 13, No. 8, P. 80

Equilibrium position and orientation of acoustically-levitated weightless object determined by calibration technique on Earth. From calibration data, possible to calculate equilibrium position and orientation in presence of Earth gravitation. Sample not levitated acoustically during calibration. Technique relies on Boltzmann-Ehrenfest adiabatic-invariance principle. One converts resonant-frequency-shift data into data on normalized acoustical potential energy. Minimum of energy occurs at equilibrium point. From gradients of acoustical potential energy, one calculates acoustical restoring force or torque on objects as function of deviation from equilibrium position or orientation.

B89-10422

VACUUM HEAD CHECKS FOAM/SUBSTRATE BONDS

JAMES F. LLOYD (Martin Marietta Corp.)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28301

Vol. 13, No. 8, P. 82

Electromechanical inspection system quickly gives measurements indicating adhesion, or lack thereof, between rigid polyurethane foam and aluminum substrate. Does not damage inspected article, easy to operate, and used to perform 'go/no-go' evaluations or as supplement to conventional destructive pull-plug

testing. Applies vacuum to small area of foam panel and measures distance through which foam pulled into vacuum. Probe head applied to specimen and evacuated through hose to controller/monitor unit. Digital voltmeter in unit reads deflection of LVDT probe head.

B89-10473

ROBOTIC TOOL FOR TIGHTENING AND CUTTING

EARL T. COONEY (McDonnell-Douglas Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21538

Vol. 13, No. 9, P. 98

Robot end effector designed for tightening tube couplers and for cutting tubes. Tool operable by simple movements and thus manipulated by technician wearing heavy protective clothing. Operates on principle of worm and pinion gear. Intended for use in building structures in space, end effector also used as hand tool for assembling truss structures for terrestrial buildings, tents, and oil rigs. Also used in place of pipe wrench in plumbing work.

B89-10474

MAKING POLYMERIC MICROSPHERES

WON-KYU RHIM (Caltech), MICHAEL T. HYSOON (Caltech), SANG-KUN CHUNG (Caltech), MICHAEL S. COLVIN (Caltech), and MANCHUIM CHANG (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17023

Vol. 13, No. 9, P. 98

Combination of advanced techniques yields uniform particles for biomedical applications. Process combines ink-jet and irradiation/freeze-polymerization techniques to make polymeric microspheres of uniform size in diameters from 100 to 400 micrometer. Microspheres used in chromatography, cell sorting, cell labeling, and manufacture of pharmaceutical materials.

B89-10475

SPRAY DEFLECTOR FOR WATER-JET MACHINING

MICHAEL A. CAWTHON

Sep. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14863

Vol. 13, No. 9, P. 99

Disk on water-jet-machining nozzle protects nozzle and parts behind it from erosion by deflected spray. Consists of stainless-steel backing with neoprene facing deflecting spray so it does not reach nut or other vital parts of water-jet apparatus.

B89-10476

COMPACT APPARATUS GROWS PROTEIN CRYSTALS

CHARLES E. BUGG (Alabama Univ.), LAWRENCE J. DELUCAS (Alabama Univ.), FRED L. SUDDATH (Alabama Univ.), ROBERT S. SNYDER (Alabama Univ.), BLAIR J. HERREN (Alabama Univ.), DANIEL C. CARTER (Alabama Univ.), and VAUGHN H. YOST (Alabama Univ.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26088

Vol. 13, No. 9, P. 100

Laboratory apparatus provides delicately balanced combination of materials and chemical conditions for growth of protein crystals. Apparatus and technique for growth based on hanging-drop method for crystallization of macromolecules. Includes pair of syringes with ganged plungers. One syringe contains protein solution; other contains precipitating-agent solution. Syringes intrude into cavity lined with porous reservoir material saturated with 1 mL or more of similar precipitating-agent solution. Prior to activation, ends of

syringes plugged to prevent transport of water vapor among three solutions.

B89-10477

MAKING JOINTLESS DUAL-DIAMETER TUBES

KATHLEEN E. KIRKHAM (Rockwell International Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29004

Vol. 13, No. 9, P. 101

Welds between sections having different diameters eliminated. Single tube made with integral tapered transition section between straight sections of different diameters and wall thicknesses. Made from single piece; contains no joints, welded or otherwise. Not prone to such weld defects as voids and need not be inspected for them. Tube fabricated by either of two methods: drawing or reduction. Both methods used to fabricate tubes of 316L corrosion-resistant stainless steel for use as heat-exchanger coil.

B89-10478

INTELLIGENT WELDING CONTROLLER

GEORGE E. COOK (Vanderbilt Univ.), RAMASWAMY KUMAR (Vanderbilt Univ.), TANUJI PRASAD (Vanderbilt Univ.), KRISTINN ANDERSEN (Mid-South Engineering), and ROBERT J. BARNETT (Mid-South Engineering)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27195

Vol. 13, No. 9, P. 102

Control system adapts to changing design requirements and operating conditions. Proposed control system for gas/tungsten arc welding requires only that operator specifies such direct parameters of welds as widths and depths of penetration. In control system for robotic welder, components and functions intimately connected with welding process assigned to controller domain. More general functions assigned to supervisor domain. Initial estimate of indirect parameters of welding process applied to system only at beginning of weld ($t=0$); after start of welding, outputs from multivariable controller takes place of estimate.

B89-10479

BONDING GAUGES TO CARBON/CARBON COMPOSITES

M. M. LEMCOE, A. H. DEUTCHMAN (Beam Alloy Corp.), R. G. BRASFIELD (Morton Thiokol), and D. E. CRAWMER (Battelle Columbus Labs.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28315

Vol. 13, No. 9, P. 102

Thermal-expansion properties modified to prevent bonds from failing. Proposed transition layer deposited between substrate and strain or temperature gauge to be bonded to substrate. Intended particularly for gauges that must operate at temperatures above 600 degrees F (320 degrees C) and substrates like fiber-reinforced carbon/carbon composites. Reduces stress caused by difference between thermal expansions of gauge and substrate materials. Without transition layer, stress often weakens or breaks bond.

B89-10480

MAKING LARGE COMPOSITE VESSELS WITHOUT AUTOCLAVES

W. A. SIGUR (Martin Marietta Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28390

Vol. 13, No. 9, P. 103

Method for making fiber-reinforced composite structure relies on heating and differential thermal expansion to provide temperature and pressure necessary to develop full strength,

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without having to place structure in large, expensive autoclave. Layers of differentially expanding material squeeze fiber-reinforce composite between them when heated. Method suitable for such cylindrical structures as pressure vessels and tanks. Used for both resin-matrix and metal-matrix composites.

B89-10481

SCREEN-PRINTED YBA₂CU₃O_{7-x} FILMS ON ALUMINA

NAROTTAM P. BANSAL, RAINEE N. SIMONS, and D. E. FARRELL (Case Western Reserve Univ.)

Sep. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-22805)

LEW-14829

Vol. 13, No. 9, P. 104

Superconducting films made in relatively simple process. Thick films of YBa₂Cu₃O_{7-x} superconductor deposited on highly-polished alumina substrates by screen printing. In addition to simplicity, screen-printing technique offers advantage that patterns for electronic and microwave circuits and devices printed directly, without additional etching steps.

B89-10482

MAKING SUBMICRON CO₂Si STRUCTURES ON SILICON SUBSTRATES

SIMON K. W. NIEH (Caltech), TRUE-LON LIN (Caltech), and ROBERT W. FATHAUER (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17736

Vol. 13, No. 9, P. 105

Experimental fabrication process makes submicron-sized structures of single-crystal metallic CoSi₂ on silicon substrates. Amorphous Co:Si(1:2) crystallized by electron beam becoming single-crystal CoSi₂. Remaining amorphous Co:Si then preferentially etched away. When fully developed, process used to make fine wires or dots exhibiting quantum confinement of charge carriers.

B89-10483

GLOVE BOX FOR HAZARDOUS LIQUIDS

R. N. ROSSIER (Martin Marietta Corp.), and B. BICKNELL (Martin Marietta Corp.)

Sep. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28392

Vol. 13, No. 9, P. 106

Proposed glove box enables technician to handle hazardous liquids safely and to clean up quickly if spill occurs. Technician places hands and arms in gloves at port to manipulate materials within the box. Glove box includes hatch that seals off glove ports so box vented and purged when necessary.

B89-10484

HEALING VOIDS IN INTERCONNECTIONS IN INTEGRATED CIRCUITS

EDWARD F. CUDDIHY (Caltech), RUSSELL A. LAWTON (Caltech), and THOMAS GAVIN (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17678

Vol. 13, No. 9, P. 108

Unusual heat treatment heals voids in aluminum interconnections on integrated circuits (IC's). Treatment consists of heating IC to temperature between 200 degrees C and 400 degrees C, holding it at that temperature, and then plunging IC immediately into liquid nitrogen. Typical holding time at evaluated temperature is 30 minutes.

B89-10485

ARC-LIGHT REFLECTOR FOR TELEVISION WELD MONITORING

STEPHEN S. GORDON (Rockwell International Corp.)

Sep. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29134

Vol. 13, No. 9, P. 110

Conical, stainless-steel mirror attached to end of welding torch improves distribution of light on work-piece as welding monitored through torch by television. Television monitoring protects operators from intense arc light and facilitates automated welding. Simple, small, and easy to install and remove, mirror relatively nonintrusive.

B89-10486

MAKING INTERNAL MOLDS OF LONG, CURVED TUBES

RICHARD K. BURLEY (Rockwell International Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29435

Vol. 13, No. 9, P. 111

Mold material carried to internal weld joint and removed after impression taken. Remotely operated device makes impression mold of interior surface of tube at weld joint. Mold provides indication of extent of mismatch between members at joint. Maneuvered to weld inspected through curved tube 3 in. in diameter by 50 in. long. Readily adapted to making molds to measure depth of corrosion in boiler tubes or other pipes.

B89-10487

LIGHTWEIGHT, HIGH-CURRENT WELDING GUN

THOMAS F. STARCK (Rockwell International Corp.), and ANDREW D. BRENNAN (Rockwell International Corp.)

Sep. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29454

Vol. 13, No. 9, P. 112

Lightweight resistance-welding, hand-held gun supplies alternating or direct current over range of 600 to 4,000 A and applies forces from 40 to 60 lb during welding. Used to weld metal sheets in multilayered stacks.

B89-10488

VARIABLE-POLARITY PLASMA ARC WELDING OF ALLOY 2219

DANIEL W. WALSH (California Polytechnic State Univ.), and ARTHUR C. NUNES, JR.

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27223

Vol. 13, No. 9, P. 113

Report presents results of study of variable-polarity plasma arc (VPPA) welding of aluminum alloy 2219. Consists of two parts: Examination of effects of microsegregation and transient weld stress on macrosegregation in weld pool and, electrical characterization of straight- and reverse-polarity portions of arc cycle.

B89-10489

GRINDING Si₃N₄ POWDER IN Si₃N₄ EQUIPMENT

THOMAS P. HERBELL, MARC R. FREEDMAN, and JAMES D. KISER

Sep. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-24839)

LEW-14821

Vol. 13, No. 9, P. 113

Three methods of grinding compared. Report based on study of grinding silicon nitride powder in preparation for sintering into solid ceramic material. Attrition, vibratory, and ball mills lined with reaction-bonded silicon nitride tested. Rates of reduction of particle sizes and changes in chemical compositions of powders measured

so grinding efficiencies and increases in impurity contents from wear of mills and media evaluated for each technique.

B89-10529**MAKING RELIABLE LARGE-DIAMETER O-RINGS**

GLADE L. LARSEN (Morton Thiokol, Inc.), and ALBERT R. HARVEY (Morton Thiokol, Inc.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28371**Vol. 13, No. 10, P. 67**

Vacuum curing yields joint-free, voidless elastomer seals. Method for manufacturing large-diameter O-rings produces them in single pieces, without bonded joints. Reduces probability trapped gases form flaws. O-rings produced, having diameters as much as 144 in. (3.66m), reliable and of high quality. Nesting upper and lower halves of mold hold elastomer rings for curing. Oil flowing through upper and lower cavities heats elastomer to cure it.

B89-10530**ALIGNING PLASMA-ARC WELDING OSCILLATIONS**

JEFF NORRIS (Martin Marietta Corp.), and MIKE FAIRLEY (Martin Marietta Corp.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28303**Vol. 13, No. 10, P. 68**

Tool aids in alignment of oscillator probe on variable-polarity plasma-arc welding torch. Probe magnetically pulls arc from side to side as it moves along joint. Tensile strength of joint depends on alignment of weld bead and on alignment of probe. Operator installs new tool on front of torch body, levels it with built-in bubble glass, inserts probe in slot on tool, and locks probe in place. Procedure faster and easier and resulting alignment more accurate and repeatable.

B89-10531**ADHERENT THERMAL BARRIER FOR COMBUSTION CHAMBER**

RICHARD J. QUENTMEYER

Oct. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-24690)

LEW-14840**Vol. 13, No. 10, P. 68**

In improved method, fabrication begins with machining of aluminum mandrel to requisite cylindrical shape. Heat-barrier coating - yttria-stabilized zirconia - plasma-sprayed on mandrel to thickness of 0.076 mm. Nickel/chromium layer about 0.025 mm thick sprayed on zirconia. Thin zirconia coating reduces maximum operating temperature of copper wall of chamber from 844 to 334 K. At lower temperature, copper liner stronger and undergoes less strain and less tendency to distort and crack.

B89-10532**CALDRON FOR HIGH-TEMPERATURE ALLOYS**

HENRY J. GERINGER

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14790**Vol. 13, No. 10, P. 69**

Induction-heated caldron melts high-temperature alloys. Prevents sort of contamination of melts occurring during arc melting in ceramic crucibles. Liquefies 200 grams of solid metal components of alloy like niobium aluminum and makes alloy homogeneous in less than 3 minutes. Plugged sleeve constitutes main body of caldron. Coolant flows through sleeve to prevent it from melting. Mandrel-wound induction coils adjusted to tune source of power. Also serves as mold for casting alloys into such shapes as bars.

B89-10533**JIG ALIGNS SHADOW MASK ON CCD**

CARLOS V. MATUS (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17672**Vol. 13, No. 10, P. 70**

Alignment viewed through microscope. Alignment jig positions shadow mask on charge-coupled device (CCD) so metal film deposited on it precisely. Allows CCD package to be inserted and removed without disturbing alignment of mask. Holds CCD packages securely and isolates it electrostatically while providing electrical contact to each of its pins. When alignment jig assembled with CCD, used to move mask under micrometer control.

B89-10568**TOOL DISTRIBUTES CLAMPING LOAD**

BARRY WAYNE SPENCER (Lockheed Space Operations Co.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11420**Vol. 13, No. 11, P. 64**

Tool distributes clamping load stably and fairly evenly among five clamping feet. Designed to stabilize and even out pressure applied to foam pads during bonding and also used in other situations where necessary to maintain fairly even clamping loads during fabrication processes. Five clamping feet, four of which adjustable, distribute clamping load and maintain clamping configuration during adhesive bonding or similar fabrication process. Used to clamp nonflat as well as flat surfaces.

B89-10569**TOOLING FOR ROBOTIC WELDER**

JACK L. WEEKS (Rockwell International Corp.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29557**Vol. 13, No. 11, P. 64**

Robot obtains welding tool and position reference quickly and automatically. Multiple tools and stands in workspace give robot access to variety of welding torches and reference positions. Feature saves time and makes it unnecessary for operator to enter within outer limit of motion of robot arm.

B89-10570**REMOVING BONDED INTEGRATED CIRCUITS FROM BOARDS**

JOHN T. RICE (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17031**Vol. 13, No. 11, P. 66**

Small resistance heater makes it easier, faster, and cheaper to remove integrated circuit from hybrid-circuit board, package, or other substrate for rework. Heater, located directly in polymeric bond interface or on substrate under integrated-circuit chip, energized when necessary to remove chip. Heat generated softens adhesive or solder that bonds chip to substrate. Chip then lifted easily from substrate.

B89-10571**CUTTING SYMMETRICAL RECESSES IN SOFT CERAMIC TILES**

TONY C. NESOTAS (Lockheed Space Operations Co.), and BRENT TYLER (Lockheed Space Operations Co.)

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

KSC-11450**Vol. 13, No. 11, P. 66**

Simple tool cuts hemispherical recesses in soft ceramic tiles.

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Designed to expose wires of thermocouples embedded in tiles without damaging leads. Creates neat, precise holes around wires. End mill includes axial hole to accommodate thermocouple wires embedded in material to be cut. Wires pass into hole without being bent or broken. Dimensions in inches. Used in place of such tools as dental picks, tweezers, spatulas, and putty knives.

B89-10572

IMPROVED TRANSPARENT FURNACE FOR CRYSTAL-GROWTH EXPERIMENTS

BRUCE N. ROSENTHAL, STEVE WHITE, and JOSEPH M. KALINOWSKI

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LEW-14895

Vol. 13, No. 11, P. 68

Novel design and fabrication process for transparent crystal-growing furnace developed. Design consists of one or more heater zones in which heating wire coiled around insides of quartz tubes. Ampoule of material supported inside furnace by guide wire. Crystal then grown by directional freezing of material in ampoule. Distinct feature of use of quartz is capability of direct visual observation of crystal-growth process during experiment. Study of transparent electronic materials conducted in new furnaces.

B89-10573

FLUID/GAS PROCESS CONTROLLER

SERGIO RAMOS (Hughes Aircraft Co.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13955

Vol. 13, No. 11, P. 70

Fluid/gas controller, or 'Super Burper', developed to obtain precise fill quantities of working fluid and noncondensable gas in heat pipe by incorporating detachable external reservoir into system during processing stage. Heat pipe filled with precise quantities of working fluid and noncondensable gas, and procedure controlled accurately. Application of device best suited for high-quality, high performance heat pipes. Device successfully implemented with various types of heat pipes, including vapor chambers, thermal diodes, large space radiators, and sideflows.

B89-10574

MAKING NOZZLES FROM HARD MATERIALS

DENNIS L. WELLS

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21299

Vol. 13, No. 11, P. 71

Proposed method of electrical-discharge machining (EDM) cuts hard materials like silicon carbide into smoothly contoured parts. Concept developed for fabrication of interior and exterior surfaces and internal cooling channels of convergent/divergent nozzles. EDM wire at skew angle theta creates hyperboloidal cavity in tube. Wire offset from axis of tube and from axis of rotation by distance equal to throat radius. Maintaining same skew angle as that used to cut hyperboloidal inner surface but using larger offset, cooling channel cut in material near inner hyperboloidal surface.

B89-10575

SHUTTER FOR VPPA-WELDING VISION SYSTEM

MURRAY J. LIRETTE (Martin Marietta Corp.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28267

Vol. 13, No. 11, P. 72

Conceptual electro-optical shutter subsystem regulates intensity of light entering video camera from variable-plasma-pulse-arc weld in process. Camera part of video system that enables welding technician to obtain better view of weld bead and puddle in light

of arc. Electro-optical shutter opened during low-illumination viewing intervals near zero crossings of welding current, preventing overloading of video camera.

B89-10576

MULTIHOLE ARC-WELDING ORIFICE

BENJI D. SWAIM (Martin Marietta Corp.)

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28322

Vol. 13, No. 11, P. 73

Modified orifice for variable-polarity plasma-arc welding directs welding plume so it creates clean, even welds on both Inconel(R) and aluminum alloys. Includes eight holes to relieve back pressure in plasma. Quality of welds on ferrous and nonferrous alloys improved as result.

B89-10577

OXYGEN-FREE RINSE WATER FOR ELECTROPLATING

RONNALD BODEMEIJER (Rockwell International Corp.), and PETER R. NEWTON (Rockwell International Corp.)

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29516

Vol. 13, No. 11, P. 74

Removal of dissolved oxygen from deionized rinse water improves bond between electroplated metal and base metal. Oxygen removed by bubbling nitrogen through rinse water before used.

B89-10578

ACID TEST FOR ANNEALING OF WELDS

GARY E. DEESE (Rockwell International Corp.), and JOSEPH P. ELLGASS (Rockwell International Corp.)

Nov. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29598

Vol. 13, No. 11, P. 74

Solution changes color if heat-treated condition lost. Simple test indicates whether welded joint retained its postweld heat-treated condition after reworking including rewelding and grinding. Test used instead of Rockwell or Brinell hardness tests when reworked surface inaccessible to hardness-testing apparatus or when small surface imperfections created by apparatus unacceptable.

B89-10579

REINFORCED HONEYCOMB PANELS

BALAKRISHNA T. BHAT (Caltech), WESLEY AKUTAGAWA (Caltech), TAYLOR G. WANG (Caltech), and DAN BARBER (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17538

Vol. 13, No. 11, P. 75

New honeycomb panel structure has increased strength and stiffness with little increase in weight. Some or all of walls of honeycomb cells reinforced with honeycomb panels having smaller cells, lightweight foam, or other reinforcing material. Strong, lightweight reinforced panels used in aircraft, car and truck bodies, cabinets for equipment and appliances, and buildings.

B89-10580

INSULATED HONEYCOMB

BALAKRISHNA T. BHAT (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17539

Vol. 13, No. 11, P. 75

Proposed insulated honeycomb structure similar to reinforced

honeycomb structure described in NPO-17538. Panels of insulated honeycomb used to make supports for solar-energy collectors and radar antennas.

B89-10581**MICROSANDWICH HONEYCOMBS**

BALAKRISHNA BHAT (Caltech), TIM O'DONNELL (Caltech), and TAYLOR WANG (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17595**Vol. 13, No. 11, P. 76**

In new type of honeycomb panel called 'microsandwich honeycomb,' walls filled with solid plastic foam reinforced with microspheres. Have compressive and shear strengths 50 to 70 percent greater than those of conventional, unfilled honeycombs of comparable dimensions and densities. Foam and hollow microspheres add little to weight but increase strength substantially. Useful in aircraft, automotive, and marine structures in which high strength and low weight important.

B89-10582**PULSED MOLECULAR BEAMS FOR GROWTH OF INAS ON GAAS**

FRANK J. GRUNTHANER (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17723**Vol. 13, No. 11, P. 76**

Pauses for annealing reduce number of defects. Deposition process that includes pulsed molecular beams produces high-quality epitaxial layers of indium arsenide on gallium arsenide substrates. Layers made as much as 30 atoms thick without introducing excessive numbers of dislocations, despite 7.4-percent mismatch between InAs and GaAs crystal lattices. Layers offer superior electrical properties in such devices as optically addressed light modulators, infrared sensors, semiconductor lasers, and high-electron-mobility transistors. Technique applicable to other epitaxial systems in which lattices highly mismatched.

B89-10583**DELAYED SHUTTERS FOR DUAL-BEAM MOLECULAR EPITAXY**

FRANK J. GRUNTHANER (Caltech), JOHN L. LIU (Caltech), and BRUCE HANCOCK (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17724**Vol. 13, No. 11, P. 78**

System of shutters for dual-molecular-beam epitaxy apparatus delays start of one beam with respect to another. Used in pulsed-beam equipment for deposition of low-dislocation layers of InAs on GaAs substrates, system delays application of arsenic beam with respect to indium beam to assure proper stoichiometric proportions on newly forming InAs surface. Reflectance high-energy electron diffraction (RHEED) instrument used to monitor condition of evolving surface of deposit. RHEED signal used to time pulsing of molecular beams in way that minimizes density of defects and holds lattice constant of InAs to that of GaAs substrate.

B89-10584**OPTOELECTRONIC SYSTEM WOULD MEASURE PROFILES OF WELDS**

C. B. DIKINSON (Martin Marietta Corp.), and J. B. HUNT (Martin Marietta Corp.)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28385**Vol. 13, No. 11, P. 80**

Less inspection time and effort required. New system not only saves considerable inspection time but also enables welding technician to make corrections during welding process to bring nonconforming weld back within specifications.

B89-10627**ENCLOSED CUTTING-AND-POLISHING APPARATUS**

R. N. ROSSIER (Martin Marietta Corp.), and B. BICKNELL (Martin Marietta Corp.)

Dec. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28393**Vol. 13, No. 12, P. 58**

Proposed apparatus cuts and polishes specimens while preventing contamination of outside environment or of subsequent specimens processed in it. Designed for use in zero gravity but also includes features useful in cutting and polishing of toxic or otherwise hazardous materials on Earth. Includes remote manipulator for handling specimens, cutting and polishing wire, inlets for gas and liquid, and outlets for waste liquid and gas. Replaceable plastic liner surrounds working space.

B90-10031**ROUNDING AND ALIGNING TUBES FOR BUTT WELDING**

RICHARD H. BURLEY (Rockwell International Corp.), and GLENN H. BUROW (Rockwell International Corp.)

Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29363**Vol. 14, No. 1, P. 62**

Easy-to-use tool helps to ensure solid, reliable joint. Tool similar to automobile-tailpipe expander corrects out-of-roundness in tubes before butt-welded and holds tubes in position during welding. Two tubes rounded and aligned with each other by expansion shoes. After use, shoes retracted so tool withdrawn, even through tube narrower than its mate.

B90-10032**DUMMY CUP HELPS ROBOT-WELDER PROGRAMMERS**

STEPHEN S. GORDON (Rockwell International Corp.)

Jan. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29499**Vol. 14, No. 1, P. 62**

Dummy gas cup used on torch of robotic welder during programming and practice runs. Made of metal or plastic, dummy cup inexpensive and durable. Withstands bumps caused by programming errors, and is sized for special welding jobs within limited clearances. After robot satisfactorily programmed, replaced by ceramic cup of same dimensions for actual welding.

B90-10033**SUPERPLASTICALLY FORMED TITANIUM HAT-STIFFENED PANELS**

RANDALL C. DAVIS, DICK M. ROYSTER, and THOMAS T. BALES

Jan. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-18119)'Analysis and Test of Superplastically Formed Titanium Hat-Stiffened Panels Under Compression'

LAR-13814**Vol. 14, No. 1, P. 63**

Recent advances in superplastic forming of some metals make it possible to fabricate new shapes. Superplastic forming enables design of structures using mass more efficiently. Parts having intersecting compound contour surfaces made; impossible to fabricate such parts by more conventional methods. Beaded hat-stiffened panel has higher critical buckling strain than conventional hat-stiffened panel.

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B90-10034 DEVELOPMENT OF ADVANCED WELDING CONTROL SYSTEM

Innovator not given (General Digital Industries, Inc.)
Jan. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-26106 Vol. 14, No. 1, P. 64

Report describes development of next-generation control
system for variable-polarity plasma arc (VPPA) welding. When fully
developed, system expected to incorporate advanced sensors and
adaptive control of position of and current in welding torch.

B90-10035 METHOD OF AUTOMATIC DOWNHAND WELDING

KEN FERNANDEZ, and GEORGE E. COOK (Vanderbilt Univ.)
Jan. 1990 Additional information available through: NTIS,
Springfield, VA 22161 (Tel:703-487-4650) (N88-17869)'A
Generalized Method for Automatic Downhand and Wirefeed Control
of a Welding Robot and Positioner'

MFS-27209 Vol. 14, No. 1, P. 65

Control algorithm satisfies several welding-process requirements
simultaneously. Report discusses part of control concept for
downhand-welding system. (In downhand welding, parts to be
welded and welding head always oriented to keep face of weld
as nearly horizontal as possible so gravitation helps to keep molten
metal in joint.) Presents mathematical basis of control algorithm
for computer-aided design/computer-aided manufacturing system
performing downhand welding.

B90-10036 WING COVERS FOR AERODYNAMIC STUDIES

MARTA R. BOHN-MEYER
Jan. 1990 Additional information available through: NTIS,
Springfield, VA 22161 (Tel:703-487-4650)
(N88-21128)'Constructing 'Gloved' Wings for Aerodynamic
Studies'

ARC-12238 Vol. 14, No. 1, P. 65

Techniques, problems, and solutions described. Report
discusses construction of thin covers - known as 'gloves' in industry
- on wings of airplanes for use in aerodynamic studies. Made of
foam cores and fiberglass-and-resin outer layers, contain
instrumentation to measure properties of boundary layers, sounds,
and pressures. Report focuses on gloves installed on F-14A and
F-15A airplanes, and compares techniques used to construct gloves
with technique used to construct glove on F-111 airplane during
previous study.

B90-10074 PRINTED-CIRCUIT TAPE MEASURES FOR X-RAY INSPECTIONS

JOHN E. SULLIVAN, JR. (Martin Marietta Corp.)
Feb. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-28388 Vol. 14, No. 2, P. 58

Known pattern impressed on x-ray image for reference. Tapes
made by flexible-printed-circuit technology provides identification
and position references for x-ray images of weld joints. Proposed
tapes consist of etched copper patterns on flexible substrates.
X-rays record pattern of tape on film beneath butt-welded panels.
Pattern becomes convenient reference for analysis and digitization
of x-ray image.

B90-10075 MAGNETICALLY-GUIDED PENETRANT APPLICATOR

ORLANDO G. MOLINA (Rockwell International Corp.)
Feb. 1990 No additional information available: For specific

technical questions contact TU Officer at Center of origin.

MFS-29358 Vol. 14, No. 2, P. 58

Small wheeled vehicle moved inside nonmagnetic enclosure.
Miniature magnetically guided truck uses foam-rubber sponge pads
to apply penetrant fluid for inspection of welds in hidden surfaces
of nonmagnetic tubes. Risk of explosion less than if electric motor
used to drive vehicle. Inexpensive to make and made in range of
sizes.

B90-10076 GRAPHITE/THERMOPLASTIC-PULTRUSION DIE

MAYWOOD L. WILSON, MARK W. FRYE, GARY S. JOHNSON,
and CLARENCE E. STANFIELD

Feb. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

LAR-13719 Vol. 14, No. 2, P. 59

Attachment to extruder produces thermoplastic-impregnated
graphite tape. Consists of profile die, fiber/resin collimator, and
crosshead die body. Die designed to be attached to commercially
available extrusion machine capable of extruding high-performance
thermoplastics. Simple attachment to commercial extruder enables
developers of composites to begin experimenting with large
numbers of proprietary resins, fibers, and hybrid composite
structures. With device, almost any possible fiber/resin combination
fabricated.

B90-10077 PHYSICS OF VARIABLE-POLARITY PLASMA ARC WELDING

DANIEL W. WALSH (Alabama Univ.), and ARTHUR C. NUNES,
JR. (Alabama Univ.)

Feb. 1990 Additional information available through: NASA STI
Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,
MD. 21240-0757

MFS-27207 Vol. 14, No. 2, P. 60

Report describes experimental study of some of the physical
and chemical effects that occur during variable-polarity plasma
arc (VPPA) keyhole welding of 2219 aluminum alloy. Comprised
three major programs: (1) determination of effects of chemical
additions (i.e., impurities) on structure and shape of bead and
keyhole; (2) determination of flow in regions surrounding keyhole;
(3) development of analog used easily to study flow in keyhole
region.

B90-10128 QUICK CHECK OF BUTT-WELD ALIGNMENT

MATTHEW A. SMITH (Rockwell International Corp.)
Mar. 1990 No additional information available: For specific
technical questions contact TU Officer at Center of origin.

MFS-29423 Vol. 14, No. 3, P. 89

Proposed tool measures alignments of plates before
butt-welded. Provides nearly instantaneous check on alignment,
thereby facilitating repetitive measurements along length of weld
joint. Reduces risk of contamination of weld from dirty measuring
tools. Middle photodetector indicates acceptable alignment when
position of transmitter fiber preciously matches that of center
receiver fiber. If plates offset, other photodetectors signal
misalignment.

B90-10129 HOT WAX SWEEPS DEBRIS FROM NARROW PASSAGES

STEVEN K. RICKLEFS (Rockwell International Corp.)
Mar. 1990 No additional information available: For specific
technical questions contact TU Officer at Center of origin.

MFS-29462 Vol. 14, No. 3, P. 89

Safe and effective technique for removal of debris and
contaminants from narrow passages involves entrainment of
undesired material in thermoplastic casting material. Semisolid wax

slightly below melting temperature pushed along passage by pressurized nitrogen to remove debris. Devised to clean out fuel passages in main combustion chamber of Space Shuttle main engine. Also applied to narrow, intricate passages in internal-combustion-engine blocks, carburetors, injection molds, and other complicated parts.

B90-10130**PREVENTING CONTAMINATION IN ELECTRON-BEAM WELDS**

WESLEY D. GOODIN (Rockwell International Corp.), KEVIN A. GULBRANDSEN (Rockwell International Corp.), and CARL OLEKSIK (Rockwell International Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29428**Vol. 14, No. 3, P. 90**

Simple expedient eliminates time-consuming, expensive manual hand grinding. Use of groove and backup tube greatly reduces postweld cleanup in some electron-beam welding operations. Tube-backup method developed for titanium parts, configurations of which prevents use of solid-block backup. In new welding configuration, tube inserted in groove to prevent contact between alumina beads and molten weld root. When welding complete and beads and tube removed, only minor spatter remains and is ground away easily.

B90-10131**FILTER ENHANCES FLUORESCENT-PENETRANT-INSPECTING BORESCOPE**

ORLANDO G. MOLINA (Rockwell International Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29379**Vol. 14, No. 3, P. 91**

Slip-on eyepiece for commercial ultraviolet-light borescope reduces both amount of short-wave ultraviolet light that reaches viewer's eye and apparent intensity of unwanted reflections of white light from surfaces undergoing inspection. Fits on stock eyepiece of borescope, which illuminates surface inspected with intense ultraviolet light. Surface, which is treated with fluorescent dye, emits bright-green visible light wherever dye penetrates - in cracks and voids. Eyepiece contains deep-yellow Wratten 15 (G) filter, which attenuates unwanted light strongly but passes yellow-green fluorescence so defects seen clearly.

B90-10132**CONNECTING MULTIPLE WIRES TO A SINGLE THROUGH HOLE**

REUBEN CORTES, G. (Rockwell International Corp.)

Mar. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29405**Vol. 14, No. 3, P. 92**

Small cup enables more than one wire to be soldered to plated through hole in printed-circuit board. Made of brass plated with silver. Inserted in eyelets or plated through holes and swaged onto boards. Used on breadboard circuits and on newly-manufactured circuit boards. Useful in modification of circuit boards, where they serve as convenient attachment points for jumper wires and leads of added components.

B90-10133**AUTOMATIC TENSION ADJUSTER FOR FLEXIBLE-SHAFT GRINDER**

RICHARD K. BURLEY (Rockwell International Corp.), and WILLIAM S. HOULT (Rockwell International Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29351**Vol. 14, No. 3, P. 93**

Flexible shaft of grinding tool automatically maintained in tension by air pressure. Probefike tool bent to reach hard-to-reach areas for grinding and polishing. Unless shaft held in tension, however, it rubs against its sheath, overheating and wearing out quickly. By taking up slack in flexible cable, tension adjuster reduces friction and enables tool to operate more efficiently, in addition to lengthening operating life.

B90-10134**WELDING AND CUTTING A NICKEL ALLOY BY LASER**

C. M. BANAS (United Technologies Corp.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27208**Vol. 14, No. 3, P. 93**

Technique effective and energy-efficient. Report describes evaluation of laser welding and cutting of Inconel(R) 718. Notes that electron-beam welding processes developed for In-718, but difficult to use on large or complex structures. Cutting of In-718 by laser fast and produces only narrow kerf. Cut edge requires dressing, to endure fatigue.

B90-10135**MAKING FIBER-REINFORCED METAL BY RAPID SOLIDIFICATION**

RONALD D. NOEBE, and IVAN E. LOCCI (Case Western Reserve Univ.)

Mar. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-15201)

LEW-14918**Vol. 14, No. 3, P. 94**

Report highlights advantages and versatility of rapid-solidification technology in fabrication of fiber-reinforced metal-matrix composites. Discusses present role and future potential of technology. Describes variety of methods for making monotape. Common to all is rapid solidification of liquid metal - 'rapid' meaning cooling rates of 10 to 4th power to 10 to 6th power K/s. Also includes tables that compare rapid-solidification methods and provides extensive list of references.

B90-10184**OPTICAL ARC-LENGTH SENSOR FOR TIG WELDING**

MATTHEW A. SMITH (Rockwell International Corp.)

Apr. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29497**Vol. 14, No. 4, P. 72**

Proposed subsystem of tungsten/inert-gas (TIG) welding system measures length of welding arc optically. Viewed by video camera, in one of three alternative optical configurations. Length of arc measured instead of inferred from voltage.

B90-10185**CALIBRATION FIXTURE FOR WELDING ROBOT**

KRISZTINA J. HOLLY (Rockwell International Corp.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29548**Vol. 14, No. 4, P. 72**

Compact, lightweight device used in any position or orientation. Calibration fixture designed for use on robotic gas/tungsten-arc welding torch equipped with vision-based seam-tracking system. Through optics in hollow torch cylinder, video camera obtains image of weld, viewing along line of sight coaxial with welding electrode. Attaches to welding-torch cylinder in place of gas cup normally attached in use. By use of longer or shorter extension tube, fixture accommodates welding electrode of unusual length.

B90-10186

BORESCOPE DEVICE TAKES IMPRESSIONS IN DUCTS

RICHARD F. WALTER (Rockwell International Corp.), and LAURA J. TURNER (Rockwell International Corp.)

Apr. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29483

Vol. 14, No. 4, P. 74

Maneuverable device built around borescope equipped to make impression molds of welded joints in interior surfaces of ducts. Molds then examined to determine degree of mismatch in welds. Inserted in duct, and color-coded handles on ends of cables used to articulate head to maneuver around corners. Use of device fairly easy and requires little training.

B90-10187

INTERNAL FILLER-WIRE FEED FOR ARC WELDING

GENE E. MORGAN (Rockwell International Corp.), and GERALD E. DYER (Rockwell International Corp.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29491

Vol. 14, No. 4, P. 75

Tungsten electrode for gas/tungsten arc welding contains lengthwise channel for feeding filler wire to weld joint. Channel makes it unnecessary to feed wire through guides outside electrode, conserving valuable space near weld and protects wire from deformation by contact with other parts in vicinity of weld. Helpful in robotic or automatic welding.

B90-10188

INTERNAL WIRE GUIDE FOR GAS/TUNGSTEN-ARC WELDING

GENE E. MORGAN (Rockwell International Corp.), and GERALD E. DYER (Rockwell International Corp.)

Apr. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29489

Vol. 14, No. 4, P. 76

Wire kept in shielding gas, preventing oxidation. Guide inside gas cup of gas/tungsten-arc welding torch feeds filler wire to weld pool along line parallel to axis of torch. Eliminates problem of how to place and orient torch to provide clearance for external wire guide.

B90-10189

SIMPLIFIED MODELS SPEED ELECTROFORMING TESTS

RONNOLD BODEMEIJER (Rockwell International Corp.), and STEVEN FILKIN (Rockwell International Corp.)

Apr. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29505

Vol. 14, No. 4, P. 76

Method of evaluating configurations of electroforming shields reduces cost of evaluation. Applicable to electroformed parts that have axes of symmetry. Involves electroforming material onto two-dimensional approximation of part in question, using side shields to be evaluated. Eliminates expense of constructing full three-dimensional model but makes possible to perform evaluation almost immediately.

B90-10190

PREPENETRANT ETCHANT FOR INCOLOGY(R) 903 WELD OVERLAYS

JOSEPH E. O'TOUSA (Rockwell International Corp.), CLARK S. THOMAS (Rockwell International Corp.), and ROBERT E. FOSTER (Rockwell International Corp.)

Apr. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29576

Vol. 14, No. 4, P. 78

Etching solution developed for use prior to type-IVC penetrant

inspection of Incolloy(R) 903 weld overlays. Formulated as follows: 80 g ferric chloride hexahydrate, 300 mL reagent-grade hydrochloric acid, 25 mL food- or reagent-grade phosphoric acid, and 100 mL ethylene glycol. Gives more reasonable range of etching time and reduces probability of overetching and resulting damage. Stored indefinitely.

B90-10230

SIMULATING A FACTORY VIA SOFTWARE

BERNARD J. SCHROER (Alabama Univ.), SHOU X. ZHANG (Alabama Univ.), and FAN T. TSENG (Alabama Univ.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28398

Vol. 14, No. 5, P. 62

Software system generates simulation program from user's responses to questions. AMPS/PC system is simulation software tool designed to aid user in defining specifications of manufacturing environment and then automatically writing code for target simulation language, GPSS/PC. Domain of problems AMPS/PC simulates is that of manufacturing assembly lines with subassembly lines and manufacturing cells. Written in Turbo Pascal Version 4.

B90-10231

SOFTWARE FOR NUMERICALLY CONTROLLED MACHINING

D. A. PREMO (Computer Consultant)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13214

Vol. 14, No. 5, P. 62

APT (Automatically Programmable Tools) system represents an adaptation, with enhancements, of public-domain version of APT IV/SSX8 to DEC VAX-11/780 computer for use by Engineering Services Division of NASA Goddard Space Flight Center. Enhancements include super pocket feature, which allows concave polygon pockets. Recent modifications include expansion of sizes of arrays and buffers to accommodate larger part programs, insertion of user-friendly error messages, and correction of programming errors that affect POCKET command and some of sculptured-surface commands (notably SSURF and SCURV). Consists of four components: translator, execution complex, subroutine library, and CL editor. Written in FORTRAN 77.

B90-10245

POSITIONING X-RAY FILM WITH STRING AND MAGNETS

WILLIAM D. LAROSA (Rockwell International Corp.), and JEFFREY E. ANDERS (Rockwell International Corp.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29448

Vol. 14, No. 5, P. 78

Technique devised to position x-ray film in normally inaccessible places for inspection of welded joints. Lead/magnet markers and string attached to ends of strips of x-ray film to facilitate positioning. Fewer shots required than in random trial-and-error sequence, and resulting images more accurate.

B90-10246

SQUEEZING SALVAGES OVERSIZE SEALS

GERALD M. STEWART (Rockwell International Corp.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29527

Vol. 14, No. 5, P. 79

Thermal and mechanical properties of seal material used to advantage. Simple sizing tool compresses polychlorotrifluoroethylene seal to smaller diameter. Polymer seal held by aluminum rings, then compressed by differential thermal

expansion between seal and rings. Inner diameter of seal reduced by small amount sufficient to enable remachining to specified size.

B90-10247**ELECTRODEPOSITED NICKEL REINFORCES OUTLET NECK**

THEODORE C. ADAMS (Rockwell International Corp.), and WILLIAM D. LAROSA (Rockwell International Corp.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29447**Vol. 14, No. 5, P. 80**

Selective plating with nickel used to reinforce outlet-neck assembly of combustion chamber of rocket engine. Plating cell built around part to be plated to enforce correct flow of plating solution. Provides relatively cheap way of thickening metal in affected regions to reduce stresses to acceptable levels.

B90-10248**WELD-BEAD SHAVER**

KAMAL GUIRGUIS (Rockwell International Corp.), and DANIEL S. PRICE (Rockwell International Corp.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29593**Vol. 14, No. 5, P. 80**

Hand-held power tool shaves excess metal from inside circumference of welded duct. Removes excess metal deposited by penetration of tungsten/inert-gas weld or by spatter from electron-beam weld. Produces smooth transition across joint. Easier to use and not prone to overshaving. Also cuts faster, removing 35 in. (89 cm) of weld bead per hour.

B90-10249**CALIBRATION FOR ON-MACHINE INSPECTIONS**

CARLTON L. HAYMAKER, JR. (Rockwell International Corp.)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29523**Vol. 14, No. 5, P. 81**

Permanent calibration setup on numerically-controlled machine tool enables fast and reliable calibration of automated probes for inspection of workpieces while still mounted on machine. Setup includes one or more artifacts, dimensions and locations known precisely and stored in memory of computer controlling machine. Before probes used to inspect newly machined part, used to check artifacts. Probe measurements compared with values in memory to determine whether probe readings need adjustment.

B90-10250**SECOND VAPOR-LEVEL SENSOR FOR VAPOR DEGREASER**

NANCE M. PAINTER (Rockwell International Corp.), and RICHARD K. BURLEY (Rockwell International Corp.)

May 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29493**Vol. 14, No. 5, P. 82**

Second vapor-level sensor installed at lower level in vapor degreaser makes possible to maintain top of vapor at that lower level. Evaporation reduced during idle periods. Provides substantial benefit, without major capital cost of building new vapor degreaser with greater freeboard height.

B90-10300**SPOT-WELDING GUN WITH ADJUSTABLE PNEUMATIC SPRING**

RICHARD K. BURLEY (Rockwell International Corp.)

Jun. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29569**Vol. 14, No. 6, P. 81**

Proposed spot-welding gun equipped with pneumatic spring,

which could be bellows or piston and cylinder, exerts force independent of position along stroke. Applies accurate controlled force to joint welded, without precise positioning at critical position within stroke.

B90-10301**MOVING LARGE WIRING-HARNESS BOARDS**

SAMUEL D. SHEPHERD (Rockwell International Corp.), and ISAAC GURMAN (Rockwell International Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29510**Vol. 14, No. 6, P. 82**

Carrier for wiring-harness fabrication boards enables lone operator to move board easily and safely. Holds harness while operator fabricating, while being stored, and being transported to equipment frame for mounting. When positioned for assembly of wiring harness, board and carrier give operator easy and convenient access to wires and cables, when positioned for transfer of wiring harness to or from storage area, carrier holds board securely while moved by one person.

B90-10302**IMPACT WIRE DISLODGES OBSTRUCTIONS**

STEVEN K. RICKLEFS (Rockwell International Corp.), and JEFFREY E. ANDERS (Rockwell International Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29513**Vol. 14, No. 6, P. 83**

Snakelike tool loosens trapped debris obstructing narrow passages in normally inaccessible locations. Flexible tool threaded into obstructed channel, much like common plumbing snake. Wire fed along inner tube of tool until tip reaches obstruction. Delivers impact from impact tool to obstruction. Designed for use in narrow, intricate coolant channels of rocket engine. Lends itself readily to modification for use in engine blocks, heat exchangers, general plumbing, and like.

B90-10303**CENTRIFUGAL BARREL FINISHING OF TURBINE-BLADE 'FIR TREES'**

JOHNNY L. MANDEL (Rockwell International Corp.)

Jun. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29553**Vol. 14, No. 6, P. 84**

Modified centrifugal barrel-finishing machine imparts desired residual compressive stresses to 'fir trees' of turbine blades. Centrifugal forces generate compressive stresses, which are transmitted to turbine blades through abrasive slurries in which suspended. Eliminates need for shot peening, rounding of edges and burrs caused by shot peening and, consequently, need for mass finishing operations to remove burrs. Improves surface finish of 'fir trees'.

B90-10304**ETCHING ELECTRODE PREVENTS ARCS**

MICHAEL J. TROST (Rockwell International Corp.), and CARL V. YANAGIHARA (Rockwell International Corp.)

Jun. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29508**Vol. 14, No. 6, P. 84**

Wooden part replaces stainless-steel part. Disposable electrode for etching Inco(R) 625 (or equivalent) alloy works better than previous, more expensive version. Size and shape of electrode makes it easier than before to etch in narrow grooves and other confined spaces. Designed to prevent arcing, which damages metal workpiece.

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B90-10366

VIEWING WELDS BY COMPUTER TOMOGRAPHY

ANTONIO G. PASCUA (Rockwell International Corp.), and JAGATJIT ROY (Rockwell International Corp.)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29555

Vol. 14, No. 7, P. 79

Computer tomography system used to inspect welds for root penetration. Source illuminates rotating welded part with fan-shaped beam of x rays or gamma rays. Detectors in circular array on opposite side of part intercept beam and convert it into electrical signals. Computer processes signals into image of cross section of weld. Image displayed on video monitor. System offers only nondestructive way to check penetration from outside when inner surfaces inaccessible.

B90-10367

RESISTANCE-WELDING TEST FIXTURE

ANDREW D. BRENNAN (Rockwell International Corp.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29426

Vol. 14, No. 7, P. 80

Realistic welding conditions produce reliable specimens. Simple fixture holds resistance-welding test specimens. Specimen holder includes metallic holder and clamps to provide electrical and thermal paths and plastic parts providing thermal and electrical isolation.

B90-10368

REMOVING BURRS IN CONFINED SPACES

FRIEDRICH WINDBIEL (Rockwell International Corp.)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29392

Vol. 14, No. 7, P. 81

Special tool proposed to remove burrs on ring edges left by operations of hollow mill near bases of round posts. Conceived because posts placed so closely together that ordinary and makeshift tools damage adjacent posts and difficult or impossible to use in narrow, deep spaces surrounding edges to be deburred. Designed specifically for use on hollow liquid-oxygen-injector posts of spacecraft engine, general tool concept adaptable to similar deburring problems on otherwise inaccessible parts.

B90-10369

PRELOADED COMPOSITE-STRUT/END-FITTING JOINT

DEAN S. MONITOR (Martin Marietta Corp.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28339

Vol. 14, No. 7, P. 82

Proposed structural joint between composite strut and metal end fitting strong and light in weight. Joint configured to distribute stresses fairly uniformly, with little interlaminar stress. Composite-strut/metal-fitting joint built up integrally with strut in layup process. Joint remains tight under reversals of loads and changes in temperature.

B90-10370

BONDING ELASTOMERS TO METAL SUBSTRATES

GEORGE E. DICKERSON, and HENRY L. KELLEY (Army Aerostructures Directorate)

Jul. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13645

Vol. 14, No. 7, P. 82

Improved, economical method for bonding elastomers to metals prevents failures caused by debonding. In new technique, vulcanization and curing occur simultaneously in specially designed

mold that acts as form for desired shape of elastomer and as container that positions and supports metal parts. Increases interface adhesion between metal, adhesive, and elastomer.

B90-10423

COMBINED BORESCOPE AND FLUSHING WAND

MIKE J. TROST (Rockwell International Corp.)

Aug. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29581

Vol. 14, No. 8, P. 62

Proposed combination borescope/flushing wand lets operator locate contaminant particles in narrow, intricate internal passages and simultaneously remove them. Video monitor displays view of contamination in internal passage, while being flushed away. Operator sees immediately whether contamination removed. Plastic isolator protects borescope. For further protection and for reduction of blurring, borescope slightly recessed from tip of wand.

B90-10424

GRINDING AWAY MICROFISSURES

GARY N. BOOTH (Rockwell International Corp.), and R. MICHAEL MALINZAK (Rockwell International Corp.)

Aug. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29566

Vol. 14, No. 8, P. 62

Treatment similar to dental polishing used to remove microfissures from metal parts without reworking adjacent surfaces. Any variety of abrasive tips attached to small motor used to grind spot treated. Configuration of grinding head must be compatible with configurations of motor and workpiece. Devised to eliminate spurious marks on welded parts.

B90-10425

POSITIONING X-RAY FILM BY BALLOON

FREDERICH WINDBIEL (Rockwell International Corp.), and KAMAL GUIRGUIS (Rockwell International Corp.)

Aug. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29588

Vol. 14, No. 8, P. 63

Film rolled around deflated balloon before being inserted in duct. Clamped at end of segmented flexible cable and fed with balloon into duct to predetermined point where inspection made, as indicated by length of cable paid out. Inflated balloon holds x-ray film against inside wall of duct for radiographic inspection. Ensures film positioned in contact with welded joint far along duct from opening through which inserted, so clear x-ray image of joint obtained.

B90-10426

BORESCOPE AIDS WELDING IN CONFINED SPACES

EDDIE CARRASCO (Rockwell International Corp.), and RONALD A. ACUNA (Rockwell International Corp.)

Aug. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29635

Vol. 14, No. 8, P. 64

Welding torch holds video borescope to give operator view of workpiece in enclosed space. Operator sees clear, magnified image on video monitor and manipulates torch accordingly, despite visual obstruction presented by enclosure. Tinted shield tilted up while torch being positioned, then down to block excess light during welding. Reduces welding time by 50 percent, and increases quality of weld substantially.

B90-10487

MONITORING BOTH SIDES OF A WELD IN PROGRESS

C. B. DICKINSON (Martin Marietta Corp.), and J. B. HUNT (Martin Marietta Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28389 Vol. 14, No. 9, P. 84

Proposed remote vision system provides simultaneous viewing of front and back of workpiece while being welded. Enables human or automatic controller to monitor both weld pool on front and weld penetration on back. Nitrogen laser generates ultraviolet light, distributed to both sides of workpiece through two optical fiber cables. Image-intensifier tubes convert reflected ultraviolet light to visible light. Video cameras equipped with high-resolution charge-coupled devices convert visible outputs of image intensifiers into images for viewing on video monitors.

B90-10488
MONITORING COATING THICKNESS DURING PLASMA SPRAYING

ROBERT A. MILLER

Sep. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-15218)'High Resolution Video Monitoring of Coating Thickness During Plasma Spraying'.

LEW-14919 Vol. 14, No. 9, P. 84

High-resolution video measures thickness accurately without interfering with process. Camera views cylindrical part through filter during plasma spraying. Lamp blacklights part, creating high-contrast silhouette on video monitor. Width analyzer counts number of lines in image of part after each pass of spray gun. Layer-by-layer measurements ensure adequate coat built up without danger of exceeding required thickness.

B90-10489
VACUUM-GAUGE CONNECTION FOR SHIPPING CONTAINER

ROBERT H. HENRY (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21523 Vol. 14, No. 9, P. 85

External connector enables measurement of vacuum in stored part. Remote-readout connector added to shipping container and connected to thermo-couple vacuum gauge in vacuum-insulated cryogenic line packed in container. Enables monitoring of condition of vacuum without opening container.

B90-10490
TREATING NICKEL ALLOY FOR SONIC QUALITY

DONALD E. STUCK (Rockwell International Corp.), DAVID KRAMER (Rockwell International Corp.), and DAN Q. LAM (Rockwell International Corp.)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29594 Vol. 14, No. 9, P. 85

Treatment makes bars of Inconel(R) 718 alloy homogeneous so acoustic waves pass through material at constant velocity. Makes possible accurate acoustic monitoring of preloads in fasteners made from bars. Eliminates longitudinal inhomogeneous regions by recrystallizing bars.

B90-10491
ROLLING SPOT WELDER

GARRET E. WAGNER (Rockwell International Corp.), and STEVE L. FONTEYNE (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29580 Vol. 14, No. 9, P. 86

Wheeled tool speeds tack-welding operations. Spotwelds foil to parts in preparation for brazing. Includes electrode wheel rolling across foil. Welding current in electrode pulsed as electrode moves along, making series of uniformly-spaced low-current spot welds.

B90-10492
CONTROLLED-PINCH SPOT WELDER

GENE E. MORGEN (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29606 Vol. 14, No. 9, P. 87

Handheld spot-welding gun clamps workpiece under air pressure instead of under operator's hand pressure. Trigger actuates both air pressure and welding current. Makes spot welds more repeatable and reliable. Reduces amount of manual labor required and enables welds to be made at faster rate. Compact and light in weight, reaches restricted area that ordinary commercial welding guns cannot.

B90-10493
DUAL-HEAD ROBOTIC WELDER

GARY S. BEARD (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29610 Vol. 14, No. 9, P. 87

Robotic welder uses two welding heads simultaneously. Developed for assembly of 'hot dog' shell on main injector for Space Shuttle main engine, concept applicable to other, similarly rounded or contoured workpieces. Opposed heads reduce distortion and stress in opposed weld joints and speed up welding operations.

B90-10494
REMOVING DROSS FROM MOLTEN SOLDER

WINSTON S. WEBB (Honeywell, Space and Strategic Avionics Div.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-28406 Vol. 14, No. 9, P. 88

Automatic device helps to assure good solder connections. Machine wipes dross away from area on surface of molten solder in pot. Sweeps across surface of molten solder somewhat in manner of windshield wiper. Each cycle of operation triggered by pulse from external robot. Equipment used wherever precise, automated soldering must be done to military specifications.

B90-10495
HOLOGRAPHIC RETICLE

EDWARD A. HENN (Rockwell International Corp.), and MARC M. SCRIBNER (Rockwell International Corp.)

Sep. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29597 Vol. 14, No. 9, P. 89

Holographic reticle proposed for use in nondestructive evaluation of surface irregularities. Extends inspection capability to include measurements of depth. Surfaces inspected without contamination, damage, or costly disassembly. Provides valuable information difficult to obtain. For example, surface defects as corrosion and porosity, as well as propagation of cracks, measured accurately. Roughness, wear, and plating thickness also measured. Also used to determine quality of microcircuits.

B90-10496
ADVANCED COMPOSITE PISTONS

ALLAN H. TAYLOR, and PHILIP O. RANSONE

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13926 Vol. 14, No. 9, P. 90

New concept involving improved configuration of reinforcing fibers and improved fabrication process proposed to improve thermal and mechanical properties of composite piston structures. Reduces amount of labor necessary to manufacture piston

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structures, with attendant reductions in costs. Single knitted-carbon-fiber sock used to form external surfaces of piston. Advantages include elimination of heavy dependence on inherently weak interlaminar properties of carbon-carbon; ease of automation to reduce fabrication costs; readily modifiable architecture to vary mechanical properties to desired values; and reduction in number of elements required to fabricate pistons. Advantage of piston structures lies in applications where light weight and high specific performance primary considerations.

B90-10552

ARC REFLECTOR FOR WELDING DUCTS

JEFFREY L. GILBERT (Rockwell International Corp.)

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29640

Vol. 14, No. 10, P. 89

Arc-light reflector for through-the-torch welding vision system designed expressly for use in welding ducts of small diameter. Cylindrical reflector positioned to reflect light diffusely from welding arc onto nearby surface of workpiece for most advantageous viewing along axis of welding torch.

B90-10553

COMPACT PINCH WELDER

THOMAS F. STARCK (Rockwell International Corp.), and ANDREW D. BRENNAN (Rockwell International Corp.)

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29612

Vol. 14, No. 10, P. 89

Compact resistance-welding pinch gun lets one operator do jobs formerly needing two workers. Light in weight and produces repeatable, high-quality weld joints. Welding-electrode head rotates for easy positioning. Lever at top of handle activates spring to pinch electrodes together at preset welding force. Button at bottom of handle activates welding current. Cables supply electrical power.

B90-10554

DIELECTRIC COATING FOR HOT-FILM FLOW SENSORS

PURNELL HOPSON, JR., and SANG Q. TRAN

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13678

Vol. 14, No. 10, P. 90

Very-thin-film dielectric coating stable over range of temperatures developed. This dielectric coating, combination of fused silica and thermoplastic polymer, has sufficient stability to withstand stresses placed upon it by cycling to and from cryogenic temperatures. Coating tailored to meet almost any criterion of roughness height. Useful for research in application of hot-film sensors to airfoils.

B90-10555

ANGLE-PLY WEAVING

GARY L. FARLEY

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14048

Vol. 14, No. 10, P. 91

Bias-direction or angle-ply weaving is proposed new process for weaving fibers along bias in conventional planar fabric or in complicated three-dimensional multilayer fabric preform of fiber-reinforced composite structure. Based upon movement of racks of needles and corresponding angle yarns across fabric as fabric being formed. Fibers woven along bias increases shear stiffness and shear strength of preform, increasing value of preform as structural member.

B90-10556

INTEGRATED PROCESS FOR INSERTION AND BEATUP OF FILL YARNS

GARY L. FARLEY

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14046

Vol. 14, No. 10, P. 92

Integrated apparatus and process devised for insertion and beatup of fill yarns during weaving of fabrics containing bias-oriented yarns. New technology supplants old shuttle method and modern water-jet method of insertion and conventional reed method of beatup. Intended for use in angle-ply or bias-direction weaving process.

B90-10557

BRAIDED COMPOSITE THREADED FASTENERS

JAMES WAYNE SAWYER

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14062

Vol. 14, No. 10, P. 94

Fasteners of carbon/carbon or other fiber/matrix composite materials made by braiding-and-molding process. Preform of braided fibers impregnated with matrix material pressed and cured in internally threaded, split mold to make externally threaded rod. Process costs less, produces stronger fasteners by avoiding breakage of fibers, and adaptable to mass production. Intended for use with ceramic and composite-material structural parts at temperatures approximately greater than 2,500 degrees F (approximately greater than 1,400 degrees C), at which metal fasteners cannot be used.

B90-10558

ENHANCEMENT OF PENETRANT-INSPECTION IMAGES

RHONDA C. WILSON (Rockwell International Corp.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29496

Vol. 14, No. 10, P. 97

Proposed computerized video system processes images of fluorescent dyes absorbed in flaws in welds. Video camera, held by operator or by remote manipulator, views weld illuminated by visible white and ultraviolet light. Images of penetrating dye in cracks and voids in weld joint appear on video monitor. Fluorescent features enhanced by software to facilitate identification of true flaws and record important data.

B90-10559

ULTRASONIC ABRASIVE REMOVAL OF EDM RECAST

JOHNNY L. MANDEL (Rockwell International Corp.), and MARLOWE S. JACOBSON (Rockwell International Corp.)

Oct. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29545

Vol. 14, No. 10, P. 97

Ultrasonic abrasive process removes layer of recast material generated during electrical-discharge machining (EDM) of damper pocket on turbine blade. Form-fitted tool vibrated ultrasonically in damper pocket from which material removed. Vibrations activate abrasive in pocket. Amount of material removed controlled precisely.

B90-10605

SPLICING WIRES PERMANENTLY WITH EXPLOSIVES

LAURENCE J. BEMENT, and ANNE C. KUSHNICK (PRC Kentron, Inc.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13825**Vol. 14, No. 11, P. 81**

Explosive joining process developed to splice wires by enclosing and metallurgically bonding wires within copper sheets. Joints exhibit many desirable characteristics, 100-percent conductivity and strength, no heat-induced annealing, no susceptibility to corrosion in contacts between dissimilar metals, and stability at high temperature. Used to join wires to terminals, as well as to splice wires. Applicable to telecommunications industry, in which millions of small wires spliced annually.

B90-10606**MAKING LIGHTWEIGHT STRUCTURES BY VAPOR DEPOSITION**

JITENDRA S. GOELA (Morton Thiokol, Inc./CVD Inc.), MICHAEL A. PICKERING (Morton Thiokol, Inc./CVD Inc.), and RAYMOND L. TAYLOR (Morton Thiokol, Inc./CVD Inc.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14059**Vol. 14, No. 11, P. 81**

Technique developed for fabrication of stiff, strong, lightweight structures of silicon carbide or other materials by any of several deposition processes. Structures made by method can have complicated shapes. Ability to manufacture complex shape from pure deposited SiC useful and leads to new products in several fields. These lightweight structures used as backup structures for optical components, as structural components in automotive, aerospace, and outer space applications, and as lightweight parts of furniture for outer space.

B90-10607**ZOOM VISION SYSTEM FOR ROBOTIC WELDING**

JEFFREY L. GILBERT (Rockwell International Corp.), and RUSSELL M. HUDYMA (Rockwell International Corp.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29712**Vol. 14, No. 11, P. 82**

Rugged zoom lens subsystem proposed for use in along-the-torch vision system of robotic welder. Enables system to adapt, via simple mechanical adjustments, to gas cups of different lengths, electrodes of different protrusions, and/or different distances between end of electrode and workpiece. Unnecessary to change optical components to accommodate changes in geometry. Easy to calibrate with respect to object in view. Provides variable focus and variable magnification.

B90-10608**SEALING NITROGEN TETROXIDE LEAKS**

GEORGE G. GARRARD (Rockwell International Corp.), DONALD W. HOUSTON (Rockwell International Corp.), and FRANK D. SCOTT (Rockwell International Corp.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21600**Vol. 14, No. 11, P. 89**

Use of Furmanite FSC-N-6B sealant in clam-shell sealing device makes it possible to stop leaks of nitrogen tetroxide through defective or improperly-seated plumbing fittings. Devised to stop leaks in vent line of small rocket motor on Space Shuttle. Also used on plumbing containing hydrazine and other hazardous fluids, and repair withstands severe temperature, vibration, and shock. Leaks stopped in place, without draining or replacement of leaking parts.

B90-10609**SELF-ALIGNING COUPLER**

EARL T. COONEY (McDonnell Douglas Corp.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21459**Vol. 14, No. 11, P. 90**

Joint reduces assembly time and eliminates fumbling. Self-aligning coupler easy to use for people wearing heavy gloves or other restrictive clothing. Consists of two threaded sections, one with blade, other with slot - joined by threaded collar. Blade fits precisely in slot. Notch in blade engages pin in slot to form temporary attachment. Collar turned on continuous thread of joined sections to form tight, rigid joint. Designed for assembly of structures by astronauts in space suits, coupler used on Earth by firefighters wearing protective garments, technicians handling hazardous materials, and others working underwater or in other difficult environments.

B90-10610**NONCONTACT ULTRASONIC VIBRATION OF WELD PUDDLES**

JEFFREY L. GILBERT (Rockwell International Corp.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29715**Vol. 14, No. 11, P. 91**

Proposed ultrasonic stimulator vibrates weld puddle without making contact. Vibration breaks up large grain clumps in solidifying puddle, creating more uniform, fine-grain microstructure. Resulting weld joint less susceptible to hot cracking and other stress-related forms of degradation.

B90-10611**IDENTIFYING BEARING BALLS WITH RADIOISOTOPES**

MYLES F. BUTNER (Rockwell International Corp.), and JOHN J. COLLINS (Rockwell International Corp.)

Nov. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29724**Vol. 14, No. 11, P. 91**

Proposed scheme for identification of members of manufactured lot of bearing balls based on detection of characteristic isotopes. All balls in lot irradiated to produce easily recognized radioactive isotopes in known concentrations and/or known ratios of concentrations and known rates of decay on their surfaces. Scheme conceived to track precise bearing balls through various stages of assembly, disassembly, and processing.

B90-10612**CHARACTERIZATION OF ROBOT WORK CELL**

RONALD R. ANDERSON (Rockwell International Corp.), VINCENT Y. PATERNOSTER (Rockwell International Corp.), and WAYNE A. GUTHMILLER (Rockwell International Corp.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29731**Vol. 14, No. 11, P. 92**

Iterative process of measurement and computation used to characterize work cell of robot, increasing accuracy of mathematical model of work cell. Characterization needed because model used in off-line programming (OLP) to compute paths to control motion of robot. Increases accuracies of model and paths.

B90-10613**POLYHEDRAL OBSERVATION CUPOLA**

KAREN S. EDELSTEIN, and GERALD D. VALLE

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21689**Vol. 14, No. 11, P. 93**

Strong, lightweight structure includes facets with windows. Report describes concept for observation cupola for Space Station Freedom. Cupola used by crewmembers to observe docking of Space Shuttle, servicing of payloads, extravehicular activity, and other operations in which they could help by observing. Includes computer-generated pictures realistically depicting crewmembers'

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positions, workstation positions, and views through various windows.

B90-10669

SOFTWARE FOR DRAWING DESIGN DETAILS CONCURRENTLY

DEWEY C. CROSBY, III (Martin Marietta Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28444

Vol. 14, No. 12, P. 57

Software system containing five computer-aided-design programs enables more than one designer to work on same part or assembly at same time. Reduces time necessary to produce design by implementing concept of parallel or concurrent detailing, in which all detail drawings documenting three-dimensional model of part or assembly produced simultaneously, rather than sequentially. Keeps various detail drawings consistent with each other and with overall design by distributing changes in each detail to all other affected details.

B90-10670

COMPUTER PROGRAM RE-LAYERS ENGINEERING DRAWINGS

DEWEY C. CROSBY, III (Martin Marietta Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28445

Vol. 14, No. 12, P. 57

RULCHK computer program aids in structuring layers of information pertaining to part or assembly designed with software described in article 'Software for Drawing Design Details Concurrently' (MFS-28444). Checks and optionally updates structure of layers for part. Enables designer to construct model and annotate its documentation without burden of manually layering part to conform to standards at design time.

B90-10671

NUMERICALLY CONTROLLED MACHINING OF WIND-TUNNEL MODELS

JOHN B. KOVTUN

Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-14004

Vol. 14, No. 12, P. 58

New procedure for dynamic models and parts for wind-tunnel tests or radio-controlled flight tests constructed. Involves use of single-phase numerical control (NC) technique to produce highly-accurate, symmetrical models in less time.

B90-10672

CLEANING WITH SUPERCRITICAL CO₂

JAMES J. HERZSTOCK (Rockwell International Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29611

Vol. 14, No. 12, P. 58

Supercritical carbon dioxide effective industrial cleaning agent. Replaces conventional halocarbon solvents for degreasing parts becoming coated with oil during such manufacturing procedures as forming and machining. Presents none of environmental threats and occupational hazards associated with halocarbon solvents. Spontaneously evaporates after use and leaves no waste to be disposed of. Evaporated gas readily collected and recycled.

B90-10673

TRANSDUCER-MOUNTING FIXTURE

KIRK W. SPIEGEL (Rockwell International Corp.)

Dec. 1990 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29600

Vol. 14, No. 12, P. 59

Transducer-mounting fixture holds transducer securely against stud. Projects only slightly beyond stud after installation. Flanged transducer fits into fixture when hinged halves open. When halves reclosed, fixture tightened onto threaded stud until stud makes contact with transducer. Knurled area on fixture aids in tightening fixture on stud.

B90-10674

WASHING OFF POLYURETHANE FOAM INSULATION

RICHARD K. BURLEY (Rockwell International Corp.), and IRVING FOGEL (Rockwell International Corp.)

Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29578

Vol. 14, No. 12, P. 59

Jet of hot water removes material quickly and safely. Simple, environmentally sound technique found to remove polyurethane foam insulation from metal parts. Developed for (but not limited to) use during rebuilding of fuel system of Space Shuttle main engine, during which insulation must be removed for penetrant inspection of metal parts.

B90-10675

MEASURING WELD PROFILES BY COMPUTER TOMOGRAPHY

ANTONIO G. PASCUA (Rockwell International Corp.), and JAGATJIT ROY (Rockwell International Corp.)

Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29554

Vol. 14, No. 12, P. 60

Noncontacting, nondestructive computer tomography system determines internal and external contours of welded objects. System makes it unnecessary to take metallurgical sections (destructive technique) or to take silicone impressions of hidden surfaces (technique that contaminates) to inspect them. Measurements of contours via tomography performed 10 times as fast as measurements via impression molds, and tomography does not contaminate inspected parts.

B90-10676

POSITIONING X-RAY FILM INSIDE A FLOW SPLITTER

CHARLES DARTER (Rockwell International Corp.), and DARRYL PIERCE (Rockwell International Corp.)

Dec. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29322

Vol. 14, No. 12, P. 61

Simple and inexpensive tool ensures secure placement for radiographic inspection. Holder places film positively and securely for x-ray inspection inside sections of tube with splitter welds. V-shaped piece of film fits on arms of holder. With arms squeezed together, holder inserted in opening of neck. Arms of holder cut from 0.020-in. (0.51-mm) thick stock of unspecified material.

B90-10677

SIMPLE REGULATOR FOR POSITIVE-PRESSURE GLOVE BOX

PAUL J. SHLICHTA (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17786

Vol. 14, No. 12, P. 62

Weighted, inflated bag regulates pressure in positive-pressure glove box such as those used to manipulate samples in atmosphere isolated from such contaminations in open air as moisture or oxygen. Weight atop the inflated bag rises and falls as gas flows into and out of bag from glove box. Positive pressure relative to surroundings pushes gloves outward when not being used. To manipulate items in box, technician forces gloves inside. Sensitive

materials manipulated in dry or inert atmosphere without danger of overpressure when technician inserts hands in gloves, or of underpressure - and inward leakage of air - when technician draws hands out of gloves. Replaces elaborate system of pressure-activated valves. Quieter, cheaper, and more reliable.

B90-10678**FTIR MONITORING OF CURING OF COMPOSITES**

MARK A. DRUY (Foster-Miller Associates, Inc.), WILLIAM A. STEVENSON (IRIS Fiber Optics, Inc.), and PHILIP R. YOUNG
Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14040**Vol. 14, No. 12, P. 62**

Infrared-sensing optical fiber system developed to monitor principal infrared absorption bands resulting from vibrations of atoms and molecules as chemical bonds form when resin cured. System monitors resin chemistry more directly. Used to obtain Fourier transform infrared (FTIR) spectrum from graphite fiber/polyimide matrix resin prepreg. Embedded fiber optic FTIR sensor used to indicate state of cure of thermosetting composite material. Developed primarily to improve quality of advanced composites, many additional potential applications exist because principal of operation applicable to all organic materials and most inorganic gases. Includes monitoring integrities of composite materials in service, remote sensing of hazardous materials, and examination of processes in industrial reactors and furnaces.

B90-10679**POLISHING DIFFICULT-TO-REACH CAVITIES**

R. MICHAEL MALINZAK (Rockwell International Corp.), and GARY N. BOOTH (Rockwell International Corp.)
Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29592**Vol. 14, No. 12, P. 63**

Springy abrasive tool used to finish surfaces of narrow cavities made by electrical-discharge machining. Robot arm moves vibrator around perimeters of cavities, polishing walls of cavities as it does so. Tool needed because such cavities inaccessible or at least difficult to reach with most surface-finishing tools.

09 MATHEMATICS AND INFORMATION SCIENCES

B86-10096**DERIVATIVES OF THE ARITHMETIC-GEOMETRIC MEAN**

F. B. TATON (Engineering Analysis, Inc.)
Jun. 1986

MFS-26018**Vol. 10, No. 1, P. 140**

Developed for theoretical studies of lightning requiring estimates of electric fields in clouds, the technique is expected to reduce computation time and improve accuracy.

B86-10159**SHADED-COLOR PICTURE GENERATION OF COMPUTER-DEFINED ARBITRARY SHAPES**

J. V. COZZOLONGO, D. L. HERMSTAD (Informatics General

Corp.), D. S. MCCOY (Informatics General Corp.), and J. CLARK (Silicon Graphics)
Jun. 1986

ARC-11496**Vol. 10, No. 2, P. 107**

SHADE computer program generates realistic color-shaded pictures from computer-defined arbitrary shapes. Objects defined for computer representation displayed as smooth, color-shaded surfaces, including varying degrees of transparency. Results also used for presentation of computational results. By performing color mapping, SHADE colors model surface to display analysis results as pressures, stresses, and temperatures. NASA has used SHADE extensively in sign and analysis of high-performance aircraft. Industry should find applications for SHADE in computer-aided design and computer-aided manufacturing. SHADE written in VAX FORTRAN and MACRO Assembler for either interactive or batch execution.

B86-10193**SIMPLIFIED DECODING OF CONVOLUTIONAL CODES**

T. K. TRUONG (Caltech), and I. S. REED (Caltech)
Jun. 1986

NPO-16514**Vol. 10, No. 2, P. 146**

Some complicated intermediate steps shortened or eliminated. Decoding of convolutional error-correcting digital codes simplified by new error-trellis syndrome technique. In new technique, syndrome vector not computed. Instead, advantage taken of newly-derived mathematical identities simplify decision tree, folding it back on itself into form called 'error trellis.' This trellis graph of all path solutions of syndrome equations. Each path through trellis corresponds to specific set of decisions as to received digits. Existing decoding algorithms combined with new mathematical identities reduce number of combinations of errors considered and enable computation of correction vector directly from data and check bits as received.

B86-10194**REPORT ON COMPUTER PROGRAMS FOR ROBOTIC VISION**

R. T. CUNNINGHAM (Caltech), and E. P. KAN (Caltech)
Jun. 1986

NPO-16565**Vol. 10, No. 2, P. 146**

Collection of programs supports robotic research. Report describes computer-vision software library NASA's Jet Propulsion Laboratory. Programs evolved during past 10 years of research into robotics. Collection includes low- and high-level image-processing software proved in applications ranging from factory automation to spacecraft tracking and grappling. Programs fall into several overlapping categories. Image utilities category are low-level routines that provide computer access to image data and some simple graphical capabilities for displaying results of image processing.

B86-10247**GRAPHICS PROGRAMS FOR THE DEC VAX COMPUTER**

D. LONG (Caltech)
May 1986

NPO-16666**Vol. 10, No. 3, P. 86**

Variety of plots available in video or printed form. LONGLIB library of computer programs set of subroutines designed for vector plotting on cathode-ray tubes and dot-matrix printers. LONGLIB subroutines invoked by program calls similar to standard CALCOMP routines. In addition to basic plotting routines, LONGLIB contains extensive set of routines to allow viewport clipping, extended character sets, graphic input, gray-level plots, polar plots, and three-dimensional plotting with or without removal of hidden lines. LONGLIB written in FORTRAN 77 and C for batch execution.

B86-10248
COMPUTING BENEFITS AND COSTS FOR PROPULSION SYSTEMS

K. HAMLYN (Martin Marietta Denver Aerospace), R. ROBERTSON (Martin Marietta Denver Aerospace), and L. ROSE (Martin Marietta Denver Aerospace)

May 1986

LEW-14129 Vol. 10, No. 3, P. 86

Flexible computer model developed for evaluating benefits and costs of placing large space systems into operational orbits. Model contains performance envelopes of three primary propulsion systems for orbit transfer based on three low-thrust engines. Allows for any mission model to be input into program. Model also allows user to easily vary program to examine effects of various ratings and weighting of benefit parameters for baseline engines. Program written in FORTRAN IV for use on IBM 370 computer.

B86-10249
ANALYZING MULTIDIMENSIONAL IMAGE DATA

S. W. WHARTON

May 1986

GSC-12935 Vol. 10, No. 3, P. 86

Six computer programs perform histogram cluster analysis. Histogram Cluster Analysis Procedure (HICAP) developed to perform unsupervised classification of multidimensional image data. Clustering approach used in HICAP based on algorithm which uses multidimensional histogram to perform unsupervised classification of four-dimensional Landsat multispectral-scanner data. HICAP generalizes this procedure to process up to 32-bit data with arbitrary number of dimensions. Also incorporates efficiency improvements so classification requires less computation than original algorithm. Computational savings afforded by HICAP increase with number of dimensions in data. HICAP programs written in FORTRAN 77 for batch or interactive execution.

B86-10250
HIGH-LEVEL DATA-ABSTRACTION SYSTEM

P. A. FISHWICK (Kentron International, Inc.)

May 1986

LAR-13244 Vol. 10, No. 3, P. 88

Communication with data-base processor flexible and efficient. High Level Data Abstraction (HILDA) system is three-layer system supporting data-abstraction features of Intel data-base processor (DBP). Purpose of HILDA establishment of flexible method of efficiently communicating with DBP. Power of HILDA lies in its extensibility with regard to syntax and semantic changes. HILDA's high-level query language readily modified. Offers powerful potential to computer sites where DBP attached to DEC VAX-series computer. HILDA system written in Pascal and FORTRAN 77 for interactive execution.

B86-10251
CONSTANT-ELASTICITY-OF-SUBSTITUTION SIMULATION

G. REITER (Caltech)

May 1986

NPO-16524 Vol. 10, No. 3, P. 88

Program simulates constant elasticity-of-substitution (CES) production function. CES function used by economic analysts to examine production costs as well as uncertainties in production. User provides such input parameters as price of labor, price of capital, and dispersion levels. CES minimizes expected cost to produce capital-uncertainty pair. By varying capital-value input, one obtains series of capital-uncertainty pairs. Capital-uncertainty pairs then used to generate several cost curves. CES program menu driven and features specific print menu for examining selected output curves. Program written in BASIC for interactive execution and implemented on IBM PC-series computer.

B86-10252
AN EXPERT-SYSTEM ENGINE WITH OPERATIVE PROBABILITIES

N. E. ORLANDO, M. T. PALMER, and R. S. WALLACE (Carnegie-Mellon University)

May 1986

LAR-13382 Vol. 10, No. 3, P. 90

Program enables proof-of-concepts tests of expert systems under development. AESOP is rule-based inference engine for expert system, which makes decisions about particular situation given user-supplied hypotheses, rules, and answers to questions drawn from rules. If knowledge base containing hypotheses and rules governing environment is available to AESOP, almost any situation within that environment resolved by answering questions asked by AESOP. Questions answered with YES, NO, MAYBE, DON'T KNOW, DON'T CARE, or with probability factor ranging from 0 to 10. AESOP written in Franz LISP for interactive execution.

B86-10303
DIGITAL FILTER SEPARATES SIGNAL FROM NOISE

W. M. LEAR (TRW, Inc.)

May 1986

MSC-20914 Vol. 10, No. 3, P. 148

Variance of signal-estimation error minimized. Mathematical technique extracts best estimates of signal component from periodic digital samples of signal plus noise. Technique combines Kalman- and smoothingfilter algorithms to minimize mean-square estimation error based on past, present, and predicted samples of signal plus noise. Technique useful in image analysis and other applications involving processing of noisy signals.

B86-10304
ADAPTIVE QUANTIZER FOR BURST SYNTHETIC-APERTURE RADAR

T. H. JOO (Caltech), D. N. HELD (Caltech), R. L. JORDAN (Caltech), and F. K. LI (Caltech)

May 1986

NPO-16582 Vol. 10, No. 3, P. 149

Adaptive quantizer for burst-mode synthetic-aperture radar reduces data rate of return signal. Device, called block floating-point quantizer (BFPQ) basically analog-to-digital converter that covers wide dynamic range and discards appropriate lower order bits. BFPQ is, in effect, digital approximator with automatic gain control. Moves floatingpoint marker binary representation of signal data in accordance with perceived dynamic range. Available step sizes thus limited to multiples of underlying smallest quantization step (represented by lowest order bit). Retains only first K most significant bits of signal; (L,K) BFPQ is one that does K-bit quantization of signal originally quantized to L bits. Quantization error simply difference between actual signal level and its binary approximation. Other potential applications for BFPQ include speech compression and picture data compression.

B86-10305
AUTONOMOUS ORBITAL CALCULATION FOR SATELLITES

K. D. MEASE (Caltech), M. S. RYNE (Caltech), and L. J. WOOD (Caltech)

May 1986

NPO-16532 Vol. 10, No. 3, P. 150

Onboard orbital navigation system reduces dependence on Earth-to-satellite links. Report discusses mathematics of proposed navigation subsystem that keeps geostationary satellite in proper orbit without ground control. Subsystem uses data from Earth and Sun sensors to activate thrusters for station-keeping maneuvers. With sensors already on satellites for determining attitude, subsystem maintains satellite within 3 degrees of specified equatorial longitude for up to 6 months. With more accurate sensors, subsystem able to maintain orbit within 0.1 degrees.

B86-10306**DECLUTTERING METHODS FOR COMPUTER-GENERATED GRAPHIC DISPLAYS**

E. EUGENE SCHULTZ, JR. (Caltech)

May 1986

NPO-16733**Vol. 10, No. 3, P. 151**

Symbol simplification and contrasting enhance viewer's ability to detect particular symbol. Report describes experiments designed to indicate how various decluttering methods affect viewer's abilities to distinguish essential from nonessential features on computer-generated graphic displays. Results indicate partial removal of nonessential graphic features through symbol simplification effective in decluttering as total removal of nonessential graphic features.

B86-10341**PROGRAM FOR GENERATING GRAPHS AND CHARTS**

C. T. ACKERSON

Jul. 1986

GSC-12925**Vol. 10, No. 4, P. 74**

Office Automation Pilot (OAP) Graphics Database system offers IBM personal computer user assistance in producing wide variety of graphs and charts and convenient data-base system, called chart base, for creating and maintaining data associated with graphs and charts. Thirteen different graphics packages available. Access graphics capabilities obtained in similar manner. User chooses creation, revision, or chartbase-maintenance options from initial menu; Enters or modifies data displayed on graphic chart. OAP graphics data-base system written in Microsoft PASCAL.

B86-10342**SCANNING PROGRAM**

W. C. MATTISON (OAO Corp.)

Jul. 1986

MSC-20904**Vol. 10, No. 4, P. 76**

SCAN program uses scanning algorithm to locate tokens in line of input data. Tokens can be command words, numbers, data values, labels. Using SCAN subroutines, user extracts tokens from character strings in languages with simple or complex syntax. SCAN thoroughly tested and implemented in NASA's Descent Design System for Shuttle orbiter. SCAN useful for other programs requiring input scanning. SCAN written in FORTRAN 77.

B86-10343**COLLECTOR-OUTPUT ANALYSIS PROGRAM**

D. R. GLANDORF (Lockheed Engineering and Management Services Co., Inc.), and ROBERT F. PHILLIPS, II (Lockheed Engineering and Management Services Co., Inc.)

Jul. 1986

MSC-20866**Vol. 10, No. 4, P. 76**

Collector-Output Analysis Program (COAP) programmer's aid for analyzing output produced by UNIVAC collector (MAP processor). COAP developed to aid in design of segmentation structures for programs with large memory requirements and numerous elements but of value in understanding relationships among components of any program. Crossreference indexes and supplemental information produced. COAP written in FORTRAN 77.

B86-10344**LANGUAGE AND PROGRAM FOR DOCUMENTING SOFTWARE DESIGN**

H. KLEINE (Caltech), and T. M. ZEPKO (Caltech)

Jul. 1986

NPO-16511**Vol. 10, No. 4, P. 76**

Software Design and Documentation Language (SDDL) provides effective communication medium to support design and documentation of complex software applications. SDDL supports

communication among all members of software design team and provides for production of informative documentation on design effort. Use of SDDL-generated document to analyze design makes it possible to eliminate many errors not detected until coding and testing attempted. SDDL processor program translates designer's creative thinking into effective document for communication. Processor performs as many automatic functions as possible, freeing designer's energy for creative effort. SDDL processor program written in PASCAL.

B86-10345**FITTING POLYNOMIAL EQUATIONS TO CURVES AND SURFACES**

P. D. ARBUCKLE, S. M. SLIWA, and S. H. TIFFANY

Jul. 1986

LAR-13457**Vol. 10, No. 4, P. 78**

FIT is computer program for interactively determining least-squares polynomial equations that fit user-supplied data. Finds leastsquares fits for functions of two independent variables. Interactive graphical and editing capabilities in FIT enables user to control polynomial equations to be fitted to data arising from most practical applications. FIT written in FORTRAN and COMPASS.

B86-10346**STRUCTURED DESIGN LANGUAGE FOR COMPUTER PROGRAMS**

WALTER H. PACE, JR. (TRW, Inc.)

Jul. 1986

MSC-20917**Vol. 10, No. 4, P. 78**

Box language used at all stages of program development. Developed to provide improved productivity in designing, coding, and maintaining computer programs. BOX system written in FORTRAN 77 for batch execution.

B86-10347**WORKSPACE PROGRAM FOR COMPLEX-NUMBER ARITHMETIC**

M. C. PATRICK, and LEONARD W. HOWELL, JR.

Jul. 1986

MFS-28111**Vol. 10, No. 4, P. 78**

COMPLEX is workspace program designed to empower APL with complexnumber capabilities. Complex-variable methods provide analytical tools invaluable for applications in mathematics, science, and engineering. COMPLEX written in APL.

B86-10348**ESTIMATING PRICES OF PRODUCTS**

R. W. ASTER (Caltech), R. G. CHAMBERLAIN (Caltech), S. C. ZENDEJAS (Caltech), T. S. LEE (Caltech), and S. MALHOTRA (Caltech)

Jul. 1986

NPO-16583**Vol. 10, No. 4, P. 79**

Company-wide or process-wide production simulated. Price Estimation Guidelines (IPEG) program provides simple, accurate estimates of prices of manufactured products. Simplification of SAMIS allows analyst with limited time and computing resources to perform greater number of sensitivity studies. Although developed for photovoltaic industry, readily adaptable to standard assembly-line type of manufacturing industry. IPEG program estimates annual production price per unit. IPEG/PC program written in TURBO PASCAL.

B86-10401**FUNCTION-KEYPAD TEMPLATE FILER**

P. A. HEADLEY (Caltech)

Jul. 1986

NPO-16676 Vol. 10, No. 4, P. 126

Each page of filer shows various keypad designations corresponding to variety of software packages. Filer has various templates bound together so they are indexed easily and stand up for ready viewing. Template filers are made of inexpensive materials. Templates of various manufacturers can be added in pages appropriately die cut to receive them. Microcomputer operators using variety of software packages assisted by simple filer that illustrates various keyboard functions corresponding to different software packages. Keyboard functions change, depending on selected software. Filer has set of templates showing keyboard functions for various software packages. Templates set up quickly as desktop references to key functions.

B86-10402
SOLVING NONLINEAR COUPLED DIFFERENTIAL EQUATIONS
L. MITCHELL (Virginia Polytechnical Institute), and J. DAVID (Virginia Polytechnical Institute)

Jul. 1986

LEW-14165 Vol. 10, No. 4, P. 127

Harmonic balance method developed to obtain approximate steady-state solutions for nonlinear coupled ordinary differential equations. Method usable with transfer matrices commonly used to analyze shaft systems. Solution to nonlinear equation, with periodic forcing function represented as sum of series similar to Fourier series but with form of terms suggested by equation itself.

B86-10403
ECONOMIC COMPARISON OF PROCESSES USING SPREADSHEET PROGRAMS
J. F. FERRALL (Caltech), A. W. PAPPANO (Caltech), and C. N. JENNINGS (Caltech)

Jul. 1986

NPO-16660 Vol. 10, No. 4, P. 128

Inexpensive approach aids plant-design decisions. Commercially available electronic spreadsheet programs aid economic comparison of different processes for producing particular end products. Facilitates plantdesign decisions without requiring large expenditures for powerful mainframe computers.

B86-10404
COMPUTER PROGRAM TO TRANSLITERATE INTO ARABIC
E. STEPHAN

Jul. 1986

KSC-11342 Vol. 10, No. 4, P. 135

Conceptual program for TRS-80, Model 12 (or equivalent) computer transliterates from English letters of computer keyboard to Arabic characters in output of associated printer. Program automatically changes character sequence from left-to-right of English to right-to-left of Arabic.

B86-10405
LARGER CONVERGENCE ZONES FOR NEWTON'S METHOD
C. W. CAMPBELL

Jul. 1986 See Also N85-28656/NSP

MFS-27124 Vol. 10, No. 4, P. 135

Iterative technique applies over wider range of initial guesses. New theorem describes convergence zone of Newton's iterative method for finding zeros of real function. Involves two points, X_p and X_{p^*} , called primary conjugate points. If exact solution lies between these points (X_p is less than X_z is less than X_{p^*}) and no other conjugate points in interval, then according to theorem, subsequent iterations will converge upon exact solution if initial guess lies in interval.

B86-10406
FIVE-PARAMETER BIVARIATE PROBABILITY DISTRIBUTION

J. TUBBS, D. BREWER, and O. W. SMITH

Jul. 1986 See Also N84-15866/NSP

MFS-27061 Vol. 10, No. 4, P. 136

NASA technical memorandum presents four papers about five-parameter bivariate gamma class of probability distributions. With some overlap of subject matter, papers address different aspects of theories of these distributions and use in forming statistical models of such phenomena as wind gusts. Provides acceptable results for defining constraints in problems designing aircraft and spacecraft to withstand large wind-gust loads.

B86-10407
CODES WITH PARITY CONDITIONS ON SUBSETS OF COORDINATES

E. POSNER (Caltech), and Z. REICHSTEIN (Caltech)

Jul. 1986

NPO-16572 Vol. 10, No. 4, P. 138

New theorems aid search for efficient code alphabets. Paper discusses theory of finding largest binary codes $2k$ bits in length, in which all words differ from each other in at least d places and in which words truncated by ignoring certain subsets of bit positions belong to shorter linear codes.

B86-10479
ESTIMATING WALL-INDUCED VELOCITIES IN WIND TUNNELS

E. T. SCHAIRER

Sep. 1986

ARC-11586 Vol. 10, No. 5, P. 125

Estimates of wall effects in two-dimensional wind tunnel obtained using upwash measurements on two contours near test model. Method derived from combination of prior techniques that correct for wall effects. Improved method limited to flows described by linear equations. Method accurately predicted wall-induced velocities along centerline of theoretical wind tunnel and confirmed that wall adjustments substantially reduced wall interference.

B86-10503
NASA TEST FILE

S. GORDON

Nov. 1986

GSC-12988 Vol. 10, No. 6, P. 61

Test File is data file containing computer-aided design (CAD) data formatted according to National Bureau of Standards Initial Graphic Exchange Specification (IGES). File created for purpose of conducting NASA tests to determine to what extent dissimilar CAD systems exchange data using the IGES standard formats and IGES translators.

B86-10524
MULTIPLE GRIDS IN FINITE-DIFFERENCE FLOW ANALYSIS

F. C. DOUGHERTY, J. L. STEGER (Stanford University), and J. A. BENEK (Calspan Corp.)

Nov. 1986

ARC-11491 Vol. 10, No. 6, P. 90

Multiple solutions superimposed to resolve flows about complex configurations. Use of multiple, overset grids in computational fluid dynamics extends application of finite-difference methods to more complex configurations. Rather than trying to generate single mesh about all components of configuration, multiple, individual meshes used, then overset on major grid. Major grid used to resolve flow field or wrapped around main component.

B86-10525
'NOISELESS' DATA-COMPRESSION ALGORITHM

R. F. RICE (Caltech), and J. J. LEE (Caltech)

Nov. 1986 See Also N85-35219/NSP

NPO-16712**Vol. 10, No. 6, P. 92**

Gamma-ray spectrometer data compressed to enable more frequent sampling. Proposed data-compression algorithm efficiently represents gamma-ray spectrometer spectra at any spectrum collection interval from 5 seconds to 5 minutes. Data representations 'noiseless' (Data exactly constructed). Techniques useful in designing datacompression algorithms for other spectral instruments, which have varying data-rate requirements.

B86-10532**PROGRAM FOR EXPERIMENTATION WITH EXPERT SYSTEMS**

S. W. ENGLE (Informatics General Corp.)

Nov. 1986

ARC-11688**Special Edition, P. 40**

CERBERUS is forward-chaining, knowledge-based system program useful for experimentation with expert systems. Inference-engine mechanism performs deductions according to user-supplied rule set. Information stored in intermediate area, and user interrogated only when no applicable data found in storage. Each assertion posed by CERBERUS answered with certainty ranging from 0 to 100 percent. Rule processor stops investigating applicable rules when goal reaches certainty of 95 percent or higher. Capable of operating for wide variety of domains. Sample rule files included for animal identification, pixel classification in image processing, and rudimentary car repair for novice mechanic. User supplies set of end goals or actions. System complexity decided by user's rule file. CERBERUS written in FORTRAN 77.

B86-10533**LISTING RELATIONSHIPS AMONG SUBROUTINES**

C. GUEST (Informatics General Corp.)

Nov. 1986

ARC-11609**Special Edition, P. 41**

HIERARCHY program is tool that assists users in obtaining information about relationships among subroutines in computer program. HIERARCHY written in FORTRAN 77.

B87-10046**MAXIMUM-LIKELIHOOD DECODER ON A HYPERCUBE MULTIPROCESSOR**

F. POLLARA (Caltech)

Jan. 1987

NPO-16724**Vol. 11, No. 1, P. 74**

Efficient parallel processing used to implement complex decoders. Hypercube multiprocessor connection scheme practical to decode long convolutional codes with efficient use of hardware. Hypercube design reduces both communication time among processors and space needed for interconnection. Decoding concept applicable to concurrent processing of digital signals using convolutional codes for error correction.

B87-10047**SOLVING FINITE-ELEMENT PROBLEMS ON A CONCURRENT PROCESSOR**

G. A. LYZENGA (Caltech), A. RAEFSKY (Caltech), and B. H. HAGER (Caltech)

Jan. 1987

NPO-16745**Vol. 11, No. 1, P. 75**

By use of 'conjugate gradients' technique, concurrent efficiency greater than 90 percent. Algorithm applies method of conjugate gradients to iterative solution of finite-element problems on concurrent processor. With algorithm, iteration rates nearly proportional to number of processors. For sufficiently large problems, fraction of proportional speedup achieved, called concurrent efficiency, exceeds 90 percent. Results indicate future application of this and related algorithms to large finite-element problems depend primarily upon applicability of iterative techniques, not upon issues of concurrency or efficiency.

B87-10048**THEORY OF PERIODIC-BINARY-SEQUENCE GENERATORS**

M. PERLMAN (Caltech)

Jan. 1987 See Also N85-22886/NSNSP

NPO-16628**Vol. 11, No. 1, P. 76**

Algorithms yield feedback shift registers with maximum regularity. Report provides extensive mathematical treatment of new and previous results related to generation of pseudo-noise binary sequences by feedback shift registers. Generator architectures amenable to efficient implementation in very-large-scale integrated (VLSI) circuits. Report includes literature references to applications of such sequences in random-number generation, radar, VLSI testing, data encryption and decryption, algebraic error-detection and error-correction encoding and decoding, and feedback-shift-register synthesis of sequential machines.

B87-10049**STRUCTURAL ERROR AND IDENTIFIABILITY IN MATHEMATICAL MODELS**

F. Y. HADAEH, and G. A. BEKEY (University of Southern California)

Jan. 1987

NPO-16661**Vol. 11, No. 1, P. 77**

Errors and previously implicit assumptions treated explicitly. Paper discusses errors in mathematical models of physical systems and problem of identifying model from system input and output. Problem approached by explicitly taking account of erroneous choices of model structure. Paper concerned specifically with linear or weakly nonlinear models.

B87-10050**NEAR IDENTIFIABILITY OF DYNAMICAL SYSTEMS**

F. Y. HADAEH, and G. A. BEKEY (University of Southern California)

Jan. 1987

NPO-16785**Vol. 11, No. 1, P. 77**

Concepts regarding approximate mathematical models treated rigorously. Paper presents new results in analysis of structural identifiability, equivalence, and near equivalence between mathematical models and physical processes they represent. Helps establish rigorous mathematical basis for concepts related to structural identifiability and equivalence revealing fundamental requirements, tacit assumptions, and sources of error. 'Structural identifiability,' as used by workers in this field, loosely translates as meaning ability to specify unique mathematical model and set of model parameters that accurately predict behavior of corresponding physical system.

B87-10102**REAL-TIME 'GARBAGE COLLECTION' FOR LIST PROCESSING**

ROBERT L. SHULER, JR.

Feb. 1987

MSC-20964**Vol. 11, No. 2, P. 76**

Two proposed algorithmic techniques for list processing enable immediate identification of computer memory cells having become inactive through disconnection from active cells, together with addition of these inactive cells to pool of reusable cells. These two 'garbage collection' techniques reduce memory requirements of list processors or increase their speed or both. With both techniques, processing continuity maintained, enabling real-time processing.

B87-10103**PARALLEL ALGORITHM SOLVES COUPLED DIFFERENTIAL EQUATIONS**

A. HAYASHI (Caltech)

09 MATHEMATICS AND INFORMATION SCIENCES

Feb. 1987

NPO-16148

Vol. 11, No. 2, P. 78

Numerical methods adapted to concurrent processing. Algorithm solves set of coupled partial differential equations by numerical integration. Adapted to run on hypercube computer, algorithm separates problem into smaller problems solved concurrently. Increase in computing speed with concurrent processing over that achievable with conventional sequential processing appreciable, especially for large problems.

B87-10130

SOLVING ORDINARY DIFFERENTIAL EQUATIONS

F. T. KROGH (Caltech)

Mar. 1987

NPO-16699

Vol. 11, No. 3, P. 42

Initial-value ordinary differential equation solution via variable order Adams method (SIVA/DIVA) package is collection of subroutines for solution of nonstiff ordinary differential equations. There are versions for single-precision and double-precision arithmetic. Requires fewer evaluations of derivatives than other variable-order Adams predictor/corrector methods. Option for direct integration of second-order equations makes integration of trajectory problems significantly more efficient. Written in FORTRAN 77.

B87-10155

MEASURING COMPUTER-OPERATOR WORKLOAD

E. E. HIRD (Caltech), and M. LEMAY (Caltech)

Mar. 1987

NPO-16281

Vol. 11, No. 3, P. 76

Subjective and objective measurements found to correlate and complement each other. Two ways of measuring workload of operator in large interactive computer system have shown meaningful and easy to use. One method based on operators' ratings of stress after subtasks in continuous task. Other method based on workload ratio, W, ratio of time required for operator to do subtask to time allowed for it. Both sensitive to workload level and individual subtasks in continuing interactive computer task. Pinpoints subtasks that press operator and use up too much available time, perhaps leading to operator errors and even failure of system. Gives clear indication when operator approaches allowed time and shows when risk of trouble becomes high.

B87-10156

UPDATED CONCEPTUAL COST ESTIMATING

J. A. BROWN

Mar. 1987

KSC-11344

Vol. 11, No. 3, P. 77

16-page report discusses development and use of NASA TR-1508, the Kennedy Space Center Aerospace Construction Price Book for preparing conceptual, budget, funding, cost-estimating, and preliminary cost-engineering reports. Updated annually from 1974 through 1985 with actual bid prices and government estimates. Includes labor and material quantities and prices with contractor and subcontractor markups for buildings, facilities, and systems at Kennedy Space Center. While data pertains to aerospace facilities, format and cost-estimating techniques guide estimation of costs in other construction applications.

B87-10157

ADVANCED DATA COLLECTION FOR INVENTORY MANAGEMENT

G. A. OPRESKO, J. H. LEET, D. F. MCGRATH, and J. EIDSON

Mar. 1987

KSC-11349

Vol. 11, No. 3, P. 77

Bar-coding, radio-frequency, and voice-operated systems selected. Report discusses study of state-of-the-art in automated collection of data for management of large inventories. Study

included comprehensive search of literature on data collection and inventory management, visits to existing automated inventory systems, and tours of selected supply and transportation facilities at Kennedy Space Center. Information collected analyzed in view of needs of conceptual inventory-management systems for Kennedy Space Center and for manned space station and other future space projects.

B87-10189

DOCUMENTING THE DEVELOPMENT OF SOFTWARE

Innovator not given (IBM Group)

Apr. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21167

Vol. 11, No. 4, P. 55

Some routine supervisory functions performed automatically. Program Management Facility (PMF) computer program integrated software-development and control system. Applicable to large software systems involving as many as several hundred programmers and one million lines of codes, it ensures timely and orderly planning, development, implementation, and documentation of software. Designed as support tool. Has many features providing efficient processing and utilization of space for development programmer. Incorporates security system to prevent improper maintenance. Provides full set of cross-referenced reports and supervisory functions for detailed management information. Written in assembler. IBM program TSO required.

B87-10210

WEIBULL DISTRIBUTION FROM INTERVAL INSPECTION DATA

MARIO H. RHEINFURTH

Apr. 1987 Additional information on Microfiche available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD 21240

MFS-27130

Vol. 11, No. 4, P. 78

Most likely failure sequence assumed. Memorandum discusses application of Weibull distribution to statistics of failures of turbopump blades. Is generalization of well known exponential random probability distribution and useful in describing component-failure modes including aging effects. Parameters found from experimental data by method of maximum likelihood.

B87-10232

GRAPH-PLOTTING ROUTINE

ANIL V. KANTAK (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16931

Vol. 11, No. 5, P. 44

Plotter routine for IBM PC (AKPLOT) designed for engineers and scientists who use graphs as integral parts of their documentation. Allows user to generate graph and edit its appearance on cathode-ray tube. Graph may undergo many interactive alterations before finally dumped from screen to be plotted by printer. Written in BASIC.

B87-10255

NONLINEAR COHERENCE FUNCTION FOR MACHINERY DIAGNOSIS

THOMAS COFFIN, and JEN Y. JONG

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28171

Vol. 11, No. 5, P. 78

Vibration spectra analyzed for signs of trouble. Nonlinear coherence function assists in analysis of vibration spectra of machinery for signs of incipient failure. Useful primarily in

determining whether apparent harmonic in complicated vibration signal indicates possible defect or if due to independent vibration source or extraneous noise.

B87-10256

MATHEMATICAL MODELS FOR DOPPLER MEASUREMENTS

WILLIAM M. LEAR (TRW, Inc.)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21150

Vol. 11, No. 5, P. 79

Error analysis increases precision of navigation. Report presents improved mathematical models of analysis of Doppler measurements and measurement errors of spacecraft navigation. To take advantage of potential navigational accuracy of Doppler measurements, precise equations relate measured cycle count to position and velocity. Drifts and random variations in transmitter and receiver oscillator frequencies taken into account. Mathematical models also adapted to aircraft navigation, radar, sonar, lidar, and interferometry.

B87-10257

APPROXIMATE FEEDBACK CONTROL FOR A SYSTEM WITH MEMORY

MARK H. MILMAN (Caltech)

May 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16841

Vol. 11, No. 5, P. 79

Report presents algorithm for calculating feedback gain for control of hereditary dynamical systems with control delay. Problem is to approximate optimal feedback gain that minimizes cost function of state and control. Theory applicable to design of controllers for mechanical systems subject to thermal deformation, electrical systems with delay, electrical systems with plasma components, and other systems that exhibit memory.

B87-10280

ACQUISITION-MANAGEMENT PROGRAM

DON E. AVERY, A. VERNON VANN, RICHARD H. JONES, and WILLIAM E. REW

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13588

Vol. 11, No. 6, P. 42

NASA Acquisition Management Subsystem (AMS) program integrated NASA-wide standard automated-procurement-system program developed in 1985. Designed to provide each NASA installation with procurement data-base concept with on-line terminals for managing, tracking, reporting, and controlling contractual actions and associated procurement data. Subsystem provides control, status, and reporting for various procurement areas. Purpose of standardization is to decrease costs of procurement and operation of automatic data processing; increases procurement productivity; furnishes accurate, on-line management information and improves customer support. Written in the ADABAS NATURAL.

B87-10281

ASSEMBLY-LINE SIMULATION PROGRAM

ROBERT G. CHAMBERLAIN (Caltech), SILVINO ZENDEJAS (Caltech), and SHAN MALHOTRA (Caltech)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16779

Vol. 11, No. 6, P. 44

Costs and profits estimated for models based on user inputs. Standard Assembly-line Manufacturing Industry Simulation (SAMIS)

program generalized so useful for production-line manufacturing companies. Provides accurate and reliable means of comparing alternative manufacturing processes. Used to assess impact of changes in financial parameters as cost of resources and services, inflation rates, interest rates, tax policies, and required rate of return of equity. Most important capability is ability to estimate prices manufacturer would have to receive for its products to recover all of costs of production and make specified profit. Written in TURBO PASCAL.

B87-10282

PROGRAMS TO AID FORTRAN PROGRAMMING

ARTHUR E. RAGOSTA

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11676

Vol. 11, No. 6, P. 44

Program-development time decreased while program quality increased. FORTRAN Programming Tools are series of programming tools used to support development and maintenance of FORTRAN 77 source codes. Included are debugging aid, central-processing-unit time-monitoring program, source-code maintenance aids, print utilities, and library of useful, well-documented programs. Tools assist in reducing development time and encouraging high-quality programming. Although intended primarily for FORTRAN programmers, some tools used on data files and other programming languages. Written in FORTRAN 77.

B87-10283

PROGRAM FOR AUTOMATED REAL-TIME MONITORING

GLENN R. GOODRUM

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20908

Vol. 11, No. 6, P. 44

Process-control decisions made by applying rules to process data streams. Expert System Executive computer program demonstrates feasibility of automated real-time monitoring. Using Executives knowledge of system formally coded as set of rules specifying actions taken under various conditions. Program makes inferences about observed data based on rules. Written in C language.

B87-10304

ALGORITHM FOR FLUID NETWORKS

BRENT A. CULLIMORE (Martin Marietta Aerospace)

Jun. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21250

Vol. 11, No. 6, P. 76

Algorithm performs either transient integration or steady-state relaxation of network that represents internal fluid system. Valid for both single and two-phase flow of any fluid and includes both heat-transfer and work terms. General enough to simulate almost any flow system to almost any degree of detail desired. Encoded into computer program FLUINT, will work in conjunction with SINDA-85 program to enable analysis of pipelines; heating, ventilating, and cooling systems; and almost any other system that involves both fluid flow and heat transfer. Other possible extensions includes effects of flexibilities of containers, high-velocity flow, gravitation, acceleration, and opening and closing valves.

B87-10342

FORTRAN ALGORITHM FOR IMAGE PROCESSING

DON J. ROTH, and DAVID R. HULL

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14291 Vol. 11, No. 7, P. 63

FORTTRAN computer algorithm containing various image-processing analysis and enhancement functions developed. Algorithm developed specifically to process images of developmental heat-engine materials obtained with sophisticated nondestructive evaluation instruments. Applications of program include scientific, industrial, and biomedical imaging for studies of flaws in materials, analyses of steel and ores, and pathology.

B87-10343**EXPERT SYSTEM FOR AUTOMATED DESIGN SYNTHESIS**

JAMES L. ROGERS, JR., and JEAN-FRANCOIS M. BARTHELEMY (Virginia Polytechnic Institute and State Univ.)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13687

Vol. 11, No. 7, P. 64

Expert-system computer program EXADS developed to aid users of Automated Design Synthesis (ADS) general-purpose optimization program. EXADS aids engineer in determining best combination based on knowledge of specific problem and expert knowledge stored in knowledge base. Available in two interactive machine versions. IBM PC version (LAR-13687) written in IQ-LISP. DEC VAX version (LAR-13688) written in Franz-LISP.

B87-10371**THE DIFFUSION OF INNOVATION**

GERARD J. EARABINO (Worcester Polytechnic Institute), G. CHRISTOPHER HEYL (Worcester Polytechnic Institute), and THOMAS J. PERCORINI (Worcester Polytechnic Institute)

Jul. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26010

Vol. 11, No. 4, P. 93

New ideas encounter obstacles on way to becoming products. Report examines process by which new ideas become products, processes, or accepted standards. Sequence of events called 'the diffusion of innovation.' Focuses on development of material processing in low gravity as case study in diffusion of innovation.

B87-10372**PARTITIONED MATRICES FOR COMBINED LINEAR SYSTEMS**

EUGENE L. DUKE (Dryden Flight Research Facility)

Jul. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-25166/NSP)

ARC-11727

Vol. 11, No. 4, P. 93

Multiple-input, multiple-output mathematical models combined. Report presents mathematical background for combination of linear multiple-input, multiple-output equations of subsystems into overall matrix equations for whole system. Development of such system mathematical models essential for design of complicated control systems.

B87-10406**PROGRAM GENERATES VIEWS OF COMPLICATED OBJECTS**

JERI W. BROWN

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21172

Vol. 11, No. 8, P. 56

PLAID is three-dimensional Computer Aided Engineering (CAE) program enabling user to construct, manipulate, and display interactively highly complex geometric models. Line drawings and other representations produced by computer-aided design. Used in engineering applications. Incorporation of techniques and features minimizes user's workload in designing and managing PLAID models. Written in FORTRAN 77.

B87-10407**MANAGING DEVELOPMENT AND MAINTENANCE OF SOFTWARE**

GERALD W. ROOK (Rockwell International Corp.), and DAVID E. STATEZNI (Rockwell International Corp.)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21142

Vol. 11, No. 8, P. 56

Source Management Utility (SMU) computer program is tool to manage development and maintenance of computer software. Its purpose to control organization of configured data sets containing source, object, and load-module files. Written in PL/1 and assembler.

B87-10437**SPACE-SUBDIVISION ALGORITHM FOR ABSTRACT TRAJECTORIES**

DOUGLAS K. LYON (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16939

Vol. 11, No. 8, P. 94

Computational overhead in testing links between nodes reduced. Computationally efficient algorithm facilitates subdivision of n-dimensional spaces during selection, testing, or optimization of trajectories in those spaces. Reduces cost of computation in such diverse problems as scheduling of interrelated events to avoid conflicts, devising efficient production-line layouts and operating schedules, routing telephone calls, and analyzing the motions of gas particles.

B87-10438**FPT ALGORITHM FOR TWO-DIMENSIONAL CYCLIC CONVOLUTIONS**

TRIEU-KIE TRUONG (Caltech), HOWARD M. SHAO (Caltech), D. Y. PEI (Caltech), and IRVING S. REED (Caltech)

Sep. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16835

Vol. 11, No. 8, P. 95

Fast-polynomial-transform (FPT) algorithm computes two-dimensional cyclic convolution of two-dimensional arrays of complex numbers. New algorithm uses cyclic polynomial convolutions of same length. Algorithm regular, modular, and expandable.

B87-10473**PROGRAM FOR ANALYSIS AND ENHANCEMENT OF IMAGES**

YUN-CHI LU

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13075

Vol. 11, No. 9, P. 66

Land Analysis System (LAS) is collection of image-analysis computer programs designed to manipulate and analyze multispectral image data. Provides user with functions ingesting various sensor data, radiometric and geometric corrections, image registration, training site selection, supervised and unsupervised classification, Fourier domain filtering, and image enhancement. Sufficiently modular and includes extensive library of subroutines to permit inclusion of new algorithmic programs. Commercial package International Mathematical & Statistical Library (IMSL) required for full implementation of LAS. Written in VAX FORTRAN 77, C, and Macro assembler for DEC VAX operating under VMS 4.0.

B87-10474**PROGRAM FOR DEVELOPMENT OF ARTIFICIAL INTELLIGENCE**

GARY RILEY, CHRIS CULBERT, and FRANK LOPEZ

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21208**Vol. 11, No. 9, P. 68**

C Language Integrated Production System (CLIPS) computer program is shell for developing expert systems. Designed to enable research, development, and delivery of artificial intelligence on conventional computers. Primary design goals for CLIPS are portability, efficiency, and functionality. Meets or out-performs most microcomputer- and minicomputer-based artificial-intelligence tools. Written in C.

B87-10475**ASSESSING THE RELIABILITY OF NDE**

DON J. ROTH

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14286**Vol. 11, No. 9, P. 68**

Versatile FORTRAN computer algorithm developed for calculating and plotting reliability of nondestructive evaluation (NDE) technique for inspection of flaws. Developed specifically to determine reliability of radiographic and ultrasonic methods for detection of critical flaws in structural ceramic materials. Reliability displayed in form of plot of probability of detection versus flaw size. NDE methods used in such applications as diagnostic medicine, quality control in industrial production, and prediction of failure in structural components.

B87-10508**SYSTEM-ASSURANCE ANALYSIS FOR NUCLEAR POWERPLANTS**

DONALD W. PAGE

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11306**Vol. 11, No. 9, P. 103**

System-assurance-analysis (SAA) methodology developed for aerospace launch-support systems proposed for nuclear powerplants. Study shows it is feasible and practical to apply SAA methodology to nuclear powerplants. Essentially combination of analytical techniques related to safety and reliability with information system assisting managers in making decisions affecting safety and reliability.

B87-10509**EFFECTS OF STRUCTURAL ERRORS ON PARAMETER ESTIMATES**

F. Y. HADAEH (University of Southern California), and G. A. BEKEY (University of Southern California)

Oct. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16816**Vol. 11, No. 9, P. 104**

Paper introduces concept of near equivalence in probability between different parameters or mathematical models of physical system. One in series of papers, each establishes different part of rigorous theory of mathematical modeling based on concepts of structural error, identifiability, and equivalence. This installment focuses upon effects of additive structural errors on degree of bias in estimates parameters.

B87-10551**ALLOCATING SPARE PARTS IN COMPLICATED SYSTEMS**

I. EISENBERGER (Caltech), G. LORDEN (Caltech), FREDRIC KAJIKAWA (Caltech), F. MAIOCCO (Caltech), JODIE GUNN (Caltech), and ETHEL KAMEYAMA (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16973**Vol. 11, No. 10, P. 67**

Assortments analyzed for cost effectiveness and effects on system functionality. Eisenberger-Maiocco algorithm (EMA) is efficient Markov algorithm to aid in provision of spare parts. Two calculations performed: forecasting availability of system with given pool of spare parts and determining most cost-effective assortment of spares. EMA written in interpreter PC-BASIC.

B87-10552**SIMULATION OF RESEARCH AND DEVELOPMENT PROJECTS**

RALPH F. MILES (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16937**Vol. 11, No. 10, P. 68**

Measures of preference for alternative project plans calculated. Simulation of Research and Development Projects (SIMRAND) program aids in optimal allocation of research and development resources needed to achieve project goals. Models system subsets or project tasks as various network paths to final goal. Each path described in terms of such task variables as cost per hour, cost per unit, and availability of resources. Uncertainty incorporated by treating task variables as probabilistic random variables. Written in Microsoft FORTRAN 77.

B87-10553**OPTIMAL NETWORK-TOPOLOGY DESIGN**

VICTOR O. K. LI (Caltech), JOSEPH H. YUEN (Caltech), TING-CHAO HOU (Caltech), and YUEN FUNG LAM (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16809**Vol. 11, No. 10, P. 68**

Candidate network designs tested for acceptability and cost. Optimal Network Topology Design computer program developed as part of study on topology design and analysis of performance of Space Station Information System (SSIS) network. Uses efficient algorithm to generate candidate network designs consisting of subsets of set of all network components, in increasing order of total costs and checks each design to see whether it forms acceptable network. Technique gives true cost-optimal network and particularly useful when network has many constraints and not too many components. Program written in PASCAL.

B87-10554**FAST-POLYNOMIAL-TRANSFORM PROGRAM**

T. K. TRUONG (Caltech), I. S. HSU (Caltech), and Y. F. CHU (Caltech)

Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17030**Vol. 11, No. 10, P. 68**

Computer program uses fast-polynomial-transformation (FPT) algorithm applicable to two-dimensional mathematical convolutions. Two-dimensional cyclic convolutions converted to one-dimensional convolutions in polynomial rings. Program decomposes cyclic polynomials into polynomial convolutions of same length. Only FPT's and fast Fourier transforms of same length required. Modular approach saves computational resources. Program written in C.

09 MATHEMATICS AND INFORMATION SCIENCES

B87-10555

MATHEMATICAL ROUTINES FOR ENGINEERS AND SCIENTISTS

A. V. KANTAK (Caltech), and F. DAVARIAN (Caltech)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17165 Vol. 11, No. 10, P. 70

Programs for frequently-used mathematical procedures save time. Package contains 16 subroutines. Each separately documented with descriptions of invoking subroutine call, its required parameters, and sample test program. Package written in FORTRAN 77.

B87-10556

ALGORITHM SORTS GROUPS OF DATA

J. D. EVANS (Caltech)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17077 Vol. 11, No. 10, P. 70

For efficient sorting, algorithm finds set containing minimum or maximum most significant data. Sets of data sorted as desired. Sorting process simplified by reduction of each multielement set of data to single representative number. First, each set of data expressed as polynomial with suitably chosen base, using elements of set as coefficients. Most significant element placed in term containing largest exponent. Base selected by examining range in value of data elements. Resulting series summed to yield single representative number. Numbers easily sorted, and each such number converted back to original set of data by successive division. Program written in BASIC.

B87-10557

COMPUTER PROGRAM FOR LINEAR ALGEBRA

F. T. KROGH (Caltech), and R. J. HANSON (Caltech)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17121 Vol. 11, No. 10, P. 70

Collection of routines provided for basic vector operations. Basic Linear Algebra Subprogram (BLAS) library is collection from FORTRAN-callable routines for employing standard techniques to perform basic operations of numerical linear algebra.

B87-10566

OPTICAL TEMPERATURE SENSOR FOR GAS TURBINES

P. W. MOSSEY (General Electric Co.)
Nov. 1987 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-28729/NSP)

LEW-14276 Vol. 11, No. 10, P. 93

New design promises accuracy even in presence of contamination. Improved sensor developed to measure gas temperatures up to 1,700 degree C in gas-turbine engines. Sensor has conical shape for mechanical strengths and optical configuration insensitive to deposits of foreign matter on sides of cone.

B87-10567

EQUATIONS FOR FADING-MEMORY FILTERS

J. I. STATMAN (Caltech)
Nov. 1987 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17089 Vol. 11, No. 10, P. 94

Report discusses simplified recursive solutions for equations of class of fading-memory filters. Under appropriate assumptions

regarding noise and exponential decay of effects of previous states, filter equations reduced to analytic formulas in closed form.

B88-10045

INTERACTIVE PLOTTING PROGRAM

JUDITH G. MOORE (Wyle Laboratories)
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13655 Vol. 12, No. 1, P. 76

Interactive Plotting Program (IAP) provides fast and easy method of plotting data in presentable format. Extensive plot editing done with various IAP commands, typed interactively from terminal or read from batch command files. Ability to redirect output to variety of devices enables user to tailor plots with graphics terminal before printing. Designed to allow addition or deletion of code for any type of terminal or plotting device. Written in FORTRAN 77 and Assembler.

B88-10046

TAPE-CERTIFICATION PROGRAM

SCOTT E. FULLNER (Caltech)
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16876 Vol. 12, No. 1, P. 76

TAPECERT is VAX utility program for tape certification. Allows user to select tape density, test pattern to use, and number of allowed retries, and to decide whether to allow extended inter-record gaps to skip past bad spots on tape. Displays system error messages and record-count information with totals every 1,000 blocks. Designed so command procedure set up with defaults for different types of certification runs. Written in FORTRAN 77.

B88-10047

LOCATING SPACEBORNE SAR IMAGERY

J. C. CURLANDER (Caltech), and S. PANG (Caltech)
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16861 Vol. 12, No. 1, P. 78

TLOCATE computer program developed to determine precise location of arbitrary picture element in digital synthetic-aperture-radar image. Written in FORTRAN 77.

B88-10048

GENERATING CROSS-REFERENCES AMONG COMPUTER ROUTINES

CLAYTON GUEST (Informatics General Corp.)
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11591 Vol. 12, No. 1, P. 78

Cray Library Load Cross-Reference (CROSSREF) computer program is tool assisting users in obtaining information about subroutines in computer-program library. Written in FORTRAN IV.

B88-10049

DESIGNING DIGITAL FILTERS

CHIANG LIN (McDonnell Douglas Corp.)
Jan. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-20982 Vol. 12, No. 1, P. 78

Digital Filter Design program presents method to compare desired and designed digital filters by minimizing sum-square error of differences in magnitude and phase angles. Written in FORTRAN IV.

B88-10068**COMPUTER SCHEDULING OF AIRPLANE ARRIVALS**

L. TOBIAS, and J. L. SCOGGINS

Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-28068/NSP)

ARC-11742**Vol. 12, No. 1, P. 96**

Prototype computer-based system developed to assist air-traffic controllers in scheduling arrivals of many airplanes at airport and at designated points along approaches to airport. Designed to follow as many as 100 airplanes within radius of 150 nautical miles. Software written in Symbolics Zetalisp language.

B88-10069**GENERATING COORDINATES FOR AERODYNAMICAL CALCULATIONS**

REESE L. SORENSON

Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-31527/NSP)

ARC-11732**Vol. 12, No. 1, P. 97**

Elliptic method generates composite grids about three-dimensional aircraft body. Grid lines on surface of wing and body vary in spacing, depending on level of detail needed to model airflow accurately in region. Grid intervals for zone might be unchanged in one direction, halved in second orthogonal direction, and reduced to much finer spacing in third direction. Computer generates grids with little or no human intervention.

B88-10070**KNOWLEDGE-ACQUISITION TOOL FOR EXPERT SYSTEM**

JAMES D. DISBROW, EUGENE L. DUKE, and VICTORIA A. REGENIE

Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-16944/NSP)

ARC-11706**Vol. 12, No. 1, P. 97**

Digital flight-control systems monitored by computer program that evaluates and recommends. Flight-systems engineers for advanced, high-performance aircraft use knowledge-acquisition tool for expert-system flight-status monitor supplying interpretative data. Interpretative function especially important in time-critical, high-stress situations because it facilitates problem identification and corrective strategy. Conditions evaluated and recommendations made by ground-based engineers having essential knowledge for analysis and monitoring of performances of advanced aircraft systems.

B88-10071**DETERMINATION OF GRAIN-SIZE DISTRIBUTIONS**

EDWARD R. GENERAZIO

Jan. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel: 703-487-4650) (N86-31065/NSP)

LEW-14508**Vol. 12, No. 1, P. 98**

Images of microstructures analyzed by transform methods. Report discusses determination of distributions of grain sizes by analysis of images of microstructures.

B88-10115**MAGNETIC-TAPE UTILITIES COMPUTER PROGRAM**

N. E. OLSON (Caltech), and R. F. JURGENS (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17190**Vol. 12, No. 2, P. 64**

Fast Magnetic Tape Utility package (MTUTILS/TUTIL) is collection of subroutines for DEC VAX/VMS computers designed to simplify access to magnetic-tape drives. Routines use standard FORTRAN argument binding and simpler than corresponding system service calls. Two sets of routines: one enables basic tape operation; other certain operations performed on sequence

of tape drives. Enables manipulation of sets of data too large to be held on single magnetic tape. Program user-friendly, menu-driven employing MTUTILS package to process tapes interactively.

B88-10116**HYBRID APPLICATIONS OF ARTIFICIAL INTELLIGENCE**

GARY C. BORCHARDT (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16965 NPO-16832**Vol. 12, No. 2, P. 65**

STAR, Simple Tool for Automated Reasoning, is interactive, interpreted programming language for development and operation of artificial-intelligence application systems. Couples symbolic processing with compiled-language functions and data structures. Written in C language and currently available in UNIX version (NPO-16832), and VMS version (NPO-16965).

B88-10148**APPROXIMATION TO THE NORMAL PROBABILITY DISTRIBUTION**

JOHN D. VEDDER (McDonnell-Douglas Corp.)

Feb. 1988 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MSC-21285**Vol. 12, No. 2, P. 96**

Closed-form expressions give $P(x)$ and $x(P)$. New equations entered in many programmable hand-held calculators, yielding quick, easy, and fairly accurate estimates of normal-probability values.

B88-10149**DYNAMIC REPLANNING SYSTEM**

HARRY J. PORTA (Caltech)

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16941**Vol. 12, No. 2, P. 96**

Artificial-intelligence computer program for planning automatically changes plan when conditions warrant. System uses planning software called SWITCH. Contains replanning input generator. Replanning done only for situations in which SWITCH has made plan but goals have changed. System assumes original knowledge base correct, which often is not the case. Future development aimed at compatibility with changing knowledge bases.

B88-10150**LIQUID-OXYGEN EXPERT SYSTEM**

JOHN R. JAMIESON, JR., and CARL I. DELAUNE

Feb. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11332**Vol. 12, No. 2, P. 97**

Complicated system monitored for equipment failures. Report summarizes structure, capabilities, and development history of Liquid-Oxygen Expert System (LES). Designed to detect immediately signs of trouble among measurements fed into current Launch Processing System (LPS). LES contains three elements: knowledge base, constraint mechanism, and diagnoser. Output of LES in form of written reports.

B88-10187**ADA LINEAR-ALGEBRA PROGRAM**

A. R. KLUMPP (Caltech), and C. L. LAWSON (Caltech)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

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MD. 21240-0757

NPO-17119

Vol. 12, No. 3, P. 56

Routines provided for common scalar, vector, matrix, and quaternion operations. Computer program extends Ada programming language to include linear-algebra capabilities similar to HAS/S programming language. Designed for such avionics applications as software for Space Station.

B88-10188

ANALYZING COMMONALITY IN A SYSTEM

ALFRED PACHECO (Boeing Co.), and KEVIN POOL (Boeing Co.)
Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28271

Vol. 12, No. 3, P. 56

Cost decreased by use of fewer types of parts. System Commonality Analysis Tool (SCAT) computer program designed to aid managers and engineers in identifying common, potentially common, and unique components of system. Incorporates three major functions: program for creation and maintenance of data base, analysis of commonality, and such system utilities as host-operating-system commands and loading and unloading of data base. Produces reports tabulating maintenance, initial configurations, and expected total costs. Written in FORTRAN 77.

B88-10203

CODING STRATEGY FOR CRITICAL DATA

LAIF SWANSON (Caltech), and JOSEPH H. YUEN (Caltech)
Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16630

Vol. 12, No. 3, P. 73

Repetition preserves most critical data during severe attenuation. Added to existing system using Reed-Solomon and convolutional encoding by additional components.

B88-10204

FAILURE-TIME DISTRIBUTION OF AN M-OUT-OF-N SYSTEM

ERNEST M. SCHEUER (Caltech)
Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17069

Vol. 12, No. 3, P. 73

Formulas for reliability extended to more general cases. Useful in analyses of reliabilities of practical systems and structures, especially of redundant systems of identical components, among which operating loads distributed equally.

B88-10205

PITCH-LEARNING ALGORITHM FOR SPEECH ENCODERS

B. R. UDAYA BHASKAR (Comsat Laboratories)
Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17045

Vol. 12, No. 3, P. 74

Adaptive algorithm detects and corrects errors in sequence of estimates of pitch period of speech. Algorithm operates in conjunction with techniques used to estimate pitch period. Used in such parametric and hybrid speech coders as linear predictive coders and adaptive predictive coders.

B88-10206

REDUCING DRIFT IN COMPUTATION OF SPACECRAFT ATTITUDE

WHITTAK H. HUANG (Martin Marietta Corp.)
Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

NPO-17027

Vol. 12, No. 3, P. 75

Error in approximation less than computer truncation error. Report discusses scheme for reduction of computational drift in estimation of attitude of spacecraft from strapdown-gyroscope measurements.

B88-10207

DETERMINING SPACECRAFT ATTITUDE FOR PLANETARY MAPPING

WHITTAK H. HUANG (Martin Marietta Corp.), and NAROTHAM S. REDDY (Martin Marietta Corp.)

Mar. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17028

Vol. 12, No. 3, P. 75

New algorithm calculates attitude with accuracy to spare. Report describes algorithm for use in determining attitude of spacecraft from incremental-angle output of strapdown gyroscope and star-scanner measurements. Highlights detail of underlying theories and strategies. Presents results of simulation to demonstrate capability of algorithm, and discusses possible applications.

B88-10245

GENERAL-PURPOSE IMAGE-DATA PROGRAM

STEVEN W. ENGLE (Informatics)
Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11712

Vol. 12, No. 4, P. 48

Image Database computer program, IBASE, is general-purpose imagery-information system. Use accomplished either by commands or through hierarchy of menus. Analytical capabilities of IBASE include contingency tables, image filtering (low-, high-, and band-pass), proximity maps, clustering, histograms, regression, slope calculations, scaling, and Boolean manipulations. Also has interface to Cheshire Image Classification expert system. Written in FORTRAN 77.

B88-10246

MAPPER OF FORTRAN PROGRAMS

CLAYTON J. GUEST (Informatics)
Apr. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11708

Vol. 12, No. 4, P. 50

SUPERMAP computer program designed to produce map of all components and attributes of FORTRAN program. Maps usage of all variables and all COMMONs used in FORTRAN program. Maps alignment of subprograms CALLED with the arguments and dummy arguments of the CALLED subprogram. Tallies externals called by each module. Written in FORTRAN 77.

B88-10295

NASKERN PROGRAM TESTS COMPUTERS

DAVID H. BAILEY (Sterling Software)
May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11726

Vol. 12, No. 5, P. 60

Computer program, NASKERN developed to aid in evaluation of performances of supercomputers. Consists of seven test-kernel programs performing computations typical of supercomputer calculations. Written in FORTRAN 77.

B88-10296

SUBROUTINES FOR IMAGE PROCESSING

NETTIE D. FAULCON, JAMES H. MONTEITH, and KEITH W. MILLER (College of William and Mary)
May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13620

Vol. 12, No. 5, P. 60

Image Processing Library computer program, IPLIB, is collection of subroutines facilitating use of COMTAL image-processing system driven by HP 1000 computer. Functions include addition or subtraction of two images with or without scaling, display of color or monochrome images, digitization of image from television camera, display of test pattern, manipulation of bits, and clearing of screen. Provides capability to read or write points, lines, and pixels from image; read or write at location of cursor; and read or write array of integers into COMTAL memory. Written in FORTRAN 77.

B88-10297

NETWORK QUEUEING SYSTEM

BRENT KINGSBURY (Sterling Software)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11750

Vol. 12, No. 5, P. 60

Program directs traffic in UNIX-based network. NQS provides facilities for remote queueing, request routing, remote status, queue-access controls, batch-request resource-quota limits, and remote output return. Written in C.

B88-10298

CALCULATING NUMBERS TO ARBITRARILY HIGH PRECISION

DAVID H. BAILEY (Sterling Software)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11725

Vol. 12, No. 5, P. 61

PITEST program is package of fast routines for performing multiprecision arithmetic. Written in FORTRAN 77.

B88-10317

ALGORITHM TO DESIGN FINITE-FIELD NORMAL-BASIS MULTIPLIERS

CHARLES C. WANG (Caltech)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17109

Vol. 12, No. 5, P. 82

Way found to exploit Massey-Omura multiplication algorithm. Generalized algorithm locates normal basis in Galois field GF(2^m) and enables development of another algorithm to construct product function.

B88-10318

ALGORITHM FOR THE DISCRETE-OUTPUT FEEDBACK PROBLEM

NESIM HALYO (Information and Control Systems, Inc.)

May 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N84-31217)

LAR-13684

Vol. 12, No. 5, P. 82

Change in cost function due to change in feedback gain calculated. Algorithm for feedback control systems considers stochastic, infinite-time, discrete-output-feedback problem for time-invariant linear systems. Optimal-output-feedback problem formulates modern control-law-design problem in which only selected number of plant-state variables used.

B88-10319

RECURSIVE ALGORITHM FOR LINEAR REGRESSION

S. V. VARANASI (Lockheed Engineering and Management Services, Inc.)

May 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21068

Vol. 12, No. 5, P. 84

Order of model determined easily. Linear-regression algorithm includes recursive equations for coefficients of model of increased order. Algorithm eliminates duplicative calculations, facilitates search for minimum order of linear-regression model fitting set of data satisfactory.

B88-10348

SEMI-MARKOV UNRELIABILITY-RANGE EVALUATOR

RICKY W. BUTLER

Jun. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13789

Vol. 12, No. 6, P. 72

Reconfigurable, fault-tolerant systems modeled. Semi-Markov unreliability-range evaluator (SURE) computer program is software tool for analysis of reliability of reconfigurable, fault-tolerant systems. Based on new method for computing death-state probabilities of semi-Markov model. Computes accurate upper and lower bounds on probability of failure of system. Written in PASCAL.

B88-10382

ARCHIVAL-SYSTEM COMPUTER PROGRAM

PETER SCOTT (Caltech), and SAMUEL CARVAJAL (Caltech)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17129

Vol. 12, No. 7, P. 58

Files stored with various degrees of relative performance. ARCHIVE system provides permanent storage area for files to which infrequent access is required. Routines designed to provide simple mechanism by which users store and retrieve files. User treats ARCHIVE as interface to 'black box' where files are stored. There are five ARCHIVE user commands, though ARCHIVE employs standard VMS directives and VAX BACKUP utility program. Special care taken to provide security needed to insure integrity of files over period of years. ARCHIVE written in DEC VAX DCL.

B88-10394

LEAST-SQUARES FREQUENCY-ACQUISITION ALGORITHM

RAJENDRA KUMAR (Caltech)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17104

Vol. 12, No. 7, P. 78

Algorithm finds frequency and phase of sinusoidal signal in presence of noise. Algorithm is special case of more-general, adaptive-parameter-estimation techniques. Computational requirements of algorithm comparable to corresponding fast-Fourier-transform (FFT) algorithm. Algorithm works directly in time domain, whereas FFT algorithm transforms data into frequency domain for estimation and detection and requires secondary algorithm to interpolate between frequencies.

B88-10395

NETWORKS OF EXECUTIVE CONTROLLERS FOR AUTOMATION

WILLIAM K. ERICKSON, and PETER C. CHEESEMAN (Research Institute For Advanced Computer Science)

Jul. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

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MD. 21240-0757

ARC-11780

Vol. 12, No. 7, P. 78

Paper discusses principal issues to be resolved in development of autonomous executive-controller shell for Space Station. Shell represents major increase in complexity of automated systems. More-complex control tasks require system that deals with different goals requiring sequences of tasks that change state of system world in complex ways. Requires integration of all functions. Applications include space station communications, tracking, life support, data processing support, navigation, and control of thermal and structural subsystems.

B88-10426

LONGLIB GRAPHICS-LIBRARY PROGRAM

DAVID G. LONG (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17443

Vol. 12, No. 8, P. 64

LONGLIB computer program is set of subroutines designed for plotting vectors of cathode-ray tubes, plotting machines, and dot-matrix and laser printers. Contains extensive set of routines to enable viewport clipping, extended character sets, graphic input shading, polar plots, and three-dimensional plotting with or without removal of hidden lines. Written in FORTRAN 77.

B88-10452

APPLICATION OF PRONY'S METHOD TO DATA ON VISCOELASTICITY

PEDRO I. RODRIGUEZ

Sep. 1988 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-17455)

MFS-27179

Vol. 12, No. 8, P. 94

Prony coefficients found by computer program, without trial and error. Computational method and computer program developed to exploit full potential of Prony's interpolation method in analysis of experimental data on relaxation modules of viscoelastic material. Prony interpolation curve chosen to give least-squares best fit to 'B-spline' interpolation of experimental data.

B88-10453

THREE-DIMENSIONAL COMPLEX VARIABLES

E. DALE MARTIN

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11756

Vol. 12, No. 8, P. 94

Report presents new theory of analytic functions of three-dimensional complex variables. While three-dimensional system subject to more limitations and more difficult to use than the two-dimensional system, useful in analysis of three-dimensional fluid flows, electrostatic potentials, and other phenomena involving harmonic functions.

B88-10454

INTEGRATED ANALYSIS OF STATIC DISTRIBUTED SYSTEMS

GUILLERMO RODRIGUEZ (Caltech), and ROBERT E. SCHEID, JR. (Caltech)

Sep. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17010

Vol. 12, No. 8, P. 96

Integrated approach encompasses modeling, identification of parameters, estimation of states, and control. Applies to models specified in part by possibly interconnected elliptic partial differential equations for deflections of structures under static loads. Appropriate for systems in which time-dependent effects

negligible and where control forces applied without exciting significant dynamic behavior.

B88-10486

VICAR/IBIS SOFTWARE SYSTEM

DANIEL F. STANFILL, IV (Caltech), and MICHAEL A. GIRARD (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17081

Vol. 12, No. 9, P. 70

Collection of programs provides extensive capabilities for manipulation of imagery and geographical data. VICAR/IBIS software system is combination of JPL VICAR (Video Image Communications and Retrieval System) image-processing system and JPL IBIS (Image Based Information System) geographic-information-management system. Provides user with extensive general-purpose image-processing capabilities, also information-management system for accepting, converting, and operating on vector (graphical) and tabular data. System used to perform various image processing functions on any sort of digitized image data, including such remotely sensed data as those from Landsat multispectral scanner.

B88-10487

SELECTED TETHER APPLICATIONS COST MODEL

MICHAEL G. KEELEY (Martin Marietta Corp.)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28260

Vol. 12, No. 9, P. 75

Diverse cost-estimating techniques and data combined into single program. Selected Tether Applications Cost Model (STACOM 1.0) is interactive accounting software tool providing means for combining several independent cost-estimating programs into fully-integrated mathematical model capable of assessing costs, analyzing benefits, providing file-handling utilities, and putting out information in text and graphical forms to screen, printer, or plotter. Program based on Lotus 1-2-3, version 2.0. Developed to provide clear, concise traceability and visibility into methodology and rationale for estimating costs and benefits of operations of Space Station tether deployer system.

B88-10488

INPUT/OUTPUT SUBROUTINE LIBRARY PROGRAM

JAMES B. COLLIER (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17053

Vol. 12, No. 9, P. 75

Efficient, easy-to-use program moved easily to different computers. Purpose of NAVIO, Input/Output Subroutine Library, provides input/output package of software for FORTRAN programs that is portable, efficient, and easy to use. Implemented as hierarchy of libraries. At bottom is very small library containing only non-portable routines called 'I/O Kernel.' Design makes NAVIO easy to move from one computer to another, by simply changing kernel. NAVIO appropriate for software system of almost any size wherein different programs communicate through files.

B88-10489

PRODUCTION OF VIEWGRAPHS WITH TEX

PETER J. SCOTT (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17299

Vol. 12, No. 9, P. 76

TEXVIEW is software package of TEX macros facilitating production of viewgraphs. Based on TEX, public-domain typesetting

language developed by Dr. Donald Knuth of Stanford University. TEXVIEW macros are grouped into following categories: format control, indentation control, font control, spacing control, graphical control, and page layout.

B88-10507

ACQUISITION TECHNIQUE FOR SPREAD-SPECTRUM CODES
UNJENG CHENG (Caltech)

Oct. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17289

Vol. 12, No. 9, P. 92

Ability to lock onto signal increased with minimal equipment. Technique proposed to improve acquisition of spread-spectrum (pseudonoise) coded signal modulated by digital data signal. Divides correlation time into subintervals, integrates over subintervals, passes integrator outputs through square-law detectors, and adds detector outputs over all subintervals to reach decision regarding detection of code. Reduces effect of data-bit transitions at price of non-coherent-combining loss.

B88-10531

FILE-FORMAT PROGRAM FOR TRANSFERABLE OUTPUT ASCII DATA

BRADFORD BINGLE (Computer Sciences Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13755

Vol. 12, No. 10, P. 56

TOAD utilities machine-independent and require minimal central memory. Transferable Output ASCII Data (TOAD) file-format computer program facilitates transfer of data files from one computer installation to another. TOAD files preferred type and record length, easy to edit, read, and write on magnetic tape or transfer across communications networks. Applications programs write TOAD files directly and conform to all ANSI FORTRAN 77 standards.

B88-10532

DEFINITION OF TOUCH-SENSITIVE ZONES FOR GRAPHICAL DISPLAYS

BURT L. MONROE, III, and DENISE R. JONES

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13822

Vol. 12, No. 10, P. 56

Touch zones defined simply by touching, while editing done automatically. Development of touch-screen interactive computing system, tedious task. Interactive Editor for Definition of Touch-Sensitive Zones computer program increases efficiency of human/machine communications by enabling user to define each zone interactively, minimizing redundancy in programming and eliminating need for manual computation of boundaries of touch areas. Information produced during editing process written to data file, to which access gained when needed by application program.

B88-10533

RATIONAL-SPLINE SUBROUTINES

JAMES R. SCHIESS, PATRICIA A. KERR, and OLIVIA C. SMITH (Computer Sciences Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13694

Vol. 12, No. 10, P. 58

Smooth curves drawn among plotted data easily. Rational-Spline Approximation with Automatic Tension Adjustment algorithm leads to flexible, smooth representation of experimental data. 'Tension' denotes mathematical analog of mechanical tension in spline or

other mechanical curve-fitting tool, and 'spline' as denotes mathematical generalization of tool. Program differs from usual spline under tension, allows user to specify different values of tension between adjacent pairs of knots rather than constant tension over entire range of data. Subroutines use automatic adjustment scheme that varies tension parameter for each interval until maximum deviation of spline from line joining knots less than or equal to amount specified by user. Procedure frees user from drudgery of adjusting individual tension parameters while still giving control over local behavior of spline.

B88-10534

PERMANENT-FILE-VALIDATION UTILITY COMPUTER PROGRAM

STEPHEN D. DERRY (Unisys Corp.)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13946

Vol. 12, No. 10, P. 58

Errors in files detected and corrected during operation. Permanent File Validation (PFVAL) utility computer program provides CDC CYBER NOS sites with mechanism to verify integrity of permanent file base. Locates and identifies permanent file errors in Mass Storage Table (MST) and Track Reservation Table (TRT), in permanent file catalog entries (PFC's) in permit sectors, and in disk sector linkage. All detected errors written to listing file and system and job day files. Program operates by reading system tables, catalog track, permit sectors, and disk linkage bytes to validate expected and actual file linkages. Used extensively to identify and locate errors in permanent files and enable online correction, reducing computer-system downtime.

B88-10550

CALCULATING ROBOT-JOINT COORDINATES FROM IMAGE COORDINATES

Innovator not given (Advanced Control Technologies)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27194

Vol. 12, No. 10, P. 76

Detailed knowledge of robot joints not required. Algorithm generates approximate mathematical models of coordinates of joints of robot as functions of coordinates of points in images of work region viewed by television cameras. Joint coordinates necessary to position and orient end effector calculated by mathematical models fitted to experimentally determined data on positions, orientations, and joint coordinates. Generates models as functions of desired location of end effector of robot. Does not require priori knowledge of kinematic equations of robot.

B88-10551

LINEAR-QUADRATIC CONTROLLER FOR AIMING A LARGE ANTENNA

JACKSON A. NICKERSON (Caltech)

Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17388

Vol. 12, No. 10, P. 78

Independent control and estimator gains selected for optimal performance. Report describes use of techniques of linear-quadratic optimal control to design digital controller aiming large antenna. Based on closed-loop concept including mathematical model of plant and independently-selectable mathematical model estimates state of system.

B88-10552

REDUCING ERRORS IN PROCESSING GPS MEASUREMENTS

W. G. MELBOURNE (Caltech)

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Nov. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17038

Vol. 12, No. 10, P. 78

Paper presents analyses of techniques for minimization of errors in estimates based on Global Positioning System measurements at multiple locations. Presents fully-redundant double-differencing algorithm for generation of weighted, double-differenced regression system that yields minimum-variance estimates. Addresses two complications arisen in previous double-differencing approaches, namely: Rank-deficient double differencing, and nondiagonal covariance matrix.

B88-10615

IDENTIFIABILITY OF SYSTEMS WITH MODELING ERRORS

YADOLAH 'FRED' HADAEIGH (Caltech), and GEORGE A. BEKEY (University of Southern California)

Dec. 1988 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17064

Vol. 12, No. 11, P. 90

Advances in theory of modeling errors reported. Recent paper on errors in mathematical models of deterministic linear or weakly nonlinear systems. Extends theoretical work described in NPO-16661 and NPO-16785. Presents concrete way of accounting for difference in structure between mathematical model and physical process or system that it represents.

B88-10616

CONCEPTUAL SPACECRAFT-GUIDANCE ALGORITHM

BERNELL R. MCCORMICK (McDonnell-Douglas Corp.), and JAMES W. COMPTON (McDonnell-Douglas Corp.)

Dec. 1988 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A86-47447)

MSC-21286

Vol. 12, No. 11, P. 90

Required weight of spacecraft minimized. Report describes conceptual algorithm for guidance of spacecraft launched from surface of Mars. Spacecraft to carry canister of specimens from surface to another spacecraft in orbit about Mars; second spacecraft then to carry canister back to Earth. Algorithm sufficiently general to be adaptable to prediction/correction algorithms for other spacecraft configurations.

B89-10038

MANAGING DATA FROM SIGNAL-PROPAGATION EXPERIMENTS

A. V. KANTAK (Caltech)

Jan. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17232

Vol. 13, No. 1, P. 81

Computer programs generate characteristic plots from amplitudes and phases. Software system enables minicomputer to process data on amplitudes and phases of signals received during experiments in ground-mobile/satellite radio propagation. Takes advantage of file-handling capabilities of UNIX operating system and C programming language. Interacts with user, under whose guidance programs in FORTRAN language generate plots of spectra or other curves of types commonly used to characterize signals. FORTRAN programs used to process file-handling outputs into any of several useful forms.

B89-10039

SCHEDULING TASKS IN PARALLEL PROCESSING

CAMILLE C. PRICE (Stephen F. Austin State University), and MOKTAR A. SALAMA (Caltech)

Jan. 1989 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17219

Vol. 13, No. 1, P. 81

Algorithms sought to minimize time and cost of computation. Report describes research on scheduling of computations tasks in system of multiple identical data processors operating in parallel. Computational intractability requires use of suboptimal heuristic algorithms. First algorithm called 'list heuristic', variation of classical list scheduling. Second algorithm called 'cluster heuristic' applied to tightly coupled tasks and consists of four phases. Third algorithm called 'exchange heuristic', iterative-improvement algorithm beginning with initial feasible assignment of tasks to processors and periods of time. Fourth algorithm is iterative one for optimal assignment of tasks and based on concept called 'simulated annealing' because of mathematical resemblance to aspects of physical annealing processes.

B89-10040

STATISTICAL ANALYSIS FOR NUCLEUS/NUCLEUS COLLISIONS

STEPHEN C. MCGUIRE (Alabama A. & M. University)

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20813)

MFS-27183

Vol. 13, No. 1, P. 83

Report describes use of several statistical techniques to characterize angular distributions of secondary particles emitted in collisions of atomic nuclei in energy range of 24 to 61 GeV per nucleon. Purpose of statistical analysis to determine correlations between intensities of emitted particles and angles confirming existence of quark/gluon plasma.

B89-10041

MODELING PLANTS WITH MOVING-AVERAGE OUTPUTS

MICHAEL E. POLITES

Jan. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-22870)

MFS-27187

Vol. 13, No. 1, P. 84

Three discrete-state-variable representations derived. Paper discusses mathematical modeling of digital control systems for plants in which outputs include combinations of instantaneous and moving-average-prefiltered measurements.

B89-10073

ELIMINATING TRACKING-SYSTEM CLOCK ERRORS

JIUN-TSONG WU (Caltech), and WILLIAM I. BERTIGER (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17098

Vol. 13, No. 2, P. 67

Problems of redundancy and correlation avoided. ORTHO computer program eliminates effect of clock errors in differential solutions for positions of users of Global Positioning System (GPS). Main application, elimination of clock errors in tracking system based on GPS. Written in FORTRAN 77.

B89-10074

STELLAR INERTIAL NAVIGATION WORKSTATION

W. JOHNSON (Abacus Programming Corp.), B. JOHNSON (Abacus Programming Corp.), and N. SWAMINATHAN (Abacus Programming Corp.)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21093

Vol. 13, No. 2, P. 68

Software and hardware assembled to support specific engineering activities. Stellar Inertial Navigation Workstation (SINW) is integrated computer workstation providing systems and engineering support functions for Space Shuttle guidance and

navigation-system logistics, repair, and procurement activities. Consists of personal-computer hardware, packaged software, and custom software integrated together into user-friendly, menu-driven system. Designed to operate on IBM PC XT. Applied in business and industry to develop similar workstations.

B89-10097

COMPRESSION OF DATA IN IMAGING RADAR POLARIMETRY
H. A. ZEBKER (Caltech), D. N. HELD (Caltech), J. J. VAN ZYL (Caltech), P. DUBOIS (Caltech), and L. NORIKANE (Caltech)
Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17184**Vol. 13, No. 2, P. 90**

Algorithms developed to reduce number of radar polarimetric data processed to synthesize image of arbitrary combination of transmitting and receiving polarizations. Brings image-processing requirements within computing capabilities of typical users, without degrading images excessively. In scattering-matrix approach to reduction of image data, four adjacent picture elements combined into one by synthesizing new scattering matrix from scattering matrices of four elements. In phase-matrix approach, phase matrices generated from scattering matrices of four adjacent picture elements, and four phase matrices added to combine four picture elements into one.

B89-10098**PARADIGM FOR STATISTICAL ANALYSIS OF THRESHOLD DETECTION**

DANIEL B. DINER (Caltech)

Feb. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17529**Vol. 13, No. 2, P. 92**

Relative values assigned to double mistakes and changed iteratively. Method for statistical analysis of threshold detection saves experimental time by enabling use of same set of measurements with respect to two thresholds. Accounts for double mistakes, unresolvable by threshold-detection technique.

B89-10131**MONITORING THE EXECUTION OF A VAX IMAGE**

PETER J. SCOTT (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17297**Vol. 13, No. 3, P. 68**

Computer program PROCSCAN developed to monitor profile of executable image during execution. Purpose to identify routines in which program is spending most of its time. PROCSCAN very useful first step in optimization of program. PROCSCAN samples program counter of executing image and compares its value to table of entry-point addresses to determine which subroutine is executing. Written in C (77 percent), Assembler (13 percent), and FORTRAN 77 (10 percent).

B89-10132**BUILDING MATHEMATICAL MODELS OF SOLID OBJECTS**

DONALD P. RANDALL (Computer Sciences Corp.), KENNIE H. JONES (Computer Sciences Corp.), WILLIAM H. VON OFENHEIM (Computer Sciences Corp.), RAYMOND L. GATES (Computer Sciences Corp.), and CHRISTINE G. MATTHEWS (Computer Sciences Corp.)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13803**Vol. 13, No. 3, P. 68**

Solid Modeling Program (SMP) version 2.0 provides capability

to model complex solid objects mathematically through aggregation of geometric primitives (parts). System provides designer with basic set of primitive parts and capability to define new primitives. Six primitives included in present version: boxes, cones, spheres, paraboloids, tori, and trusses. Written in VAX/VMS FORTRAN 77.

B89-10150**IMPROVED ALGORITHM FOR FINITE-FIELD NORMAL-BASIS MULTIPLIERS**

C. C. WANG (Caltech)

Mar. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17225**Vol. 13, No. 3, P. 87**

Improved algorithm reduces complexity of calculations that must precede design of Massey-Omura finite-field normal-basis multipliers, used in error-correcting-code equipment and cryptographic devices. Algorithm represents an extension of development reported in 'Algorithm To Design Finite-Field Normal-Basis Multipliers' (NPO-17109), NASA Tech Briefs, Vol. 12, No. 5, page 82.

B89-10209**MORE ON THE DECODER-ERROR PROBABILITY OF REED-SOLOMON CODES**

KAR-MING CHEUNG (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17467**Vol. 13, No. 4, P. 112**

Paper extends theory of decoder-error probability for linear maximum-distance separable (MDS) codes. General class of error-correcting codes includes Reed-Solomon codes, important in communications with distant spacecraft, military communications, and compact-disk recording industry. Advancing beyond previous theoretical developments that placed upper bounds on decoder-error probabilities, author derives an exact formula for probability $PE(u)$ that decoder will make error when u code symbols in error.

B89-10210**DESIGN OF TRELLIS CODES FOR FADING CHANNELS**

MARVIN K. SIMON (Caltech), and DARIUSH DIVSALAR (Caltech)

Apr. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17356**Vol. 13, No. 4, P. 112**

Report develops theoretical basis for design of trellis codes that perform optimally when used in multiple trellis-coded modulation on Rician fading communication channels. Codes perform better than codes designed to be optimal on nonfading channels with only additive white Gaussian noise (AWGN). Design of improved codes based on new distance measure suitable for fading channels. ('Distance' denotes measure of separation in abstract space in theory of codes rather than in ordinary three-dimensional space.)

B89-10243**CALCULATING CUMULATIVE BINOMIAL-DISTRIBUTION PROBABILITIES**

ERNEST M. SCHEUER (Caltech), and PAUL N. BOWERMAN (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17555**Vol. 13, No. 5, P. 69**

Cumulative-binomial computer program, CUMBIN, one of set of three programs, calculates cumulative binomial probability

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distributions for arbitrary inputs. CUMBIN, NEWTONP (NPO-17556), and CROSSER (NPO-17557), used independently of one another. Reliabilities and availabilities of k-out-of-n systems analyzed. Used by statisticians and users of statistical procedures, test planners, designers, and numerical analysts. Used for calculations of reliability and availability. Program written in C.

B89-10244

SYSTEM-RELIABILITY CUMULATIVE-BINOMIAL PROGRAM

ERNEST M. SCHEUER (Caltech), and PAUL N. BOWERMAN (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17556

Vol. 13, No. 5, P. 70

Cumulative-binomial computer program, NEWTONP, one of set of three programs, calculates cumulative binomial probability distributions for arbitrary inputs. NEWTONP, CUMBIN (NPO-17555), and CROSSER (NPO-17557), used independently of one another. Program finds probability required to yield given system reliability. Used by statisticians and users of statistical procedures, test planners, designers, and numerical analysts. Program written in C.

B89-10245

COMMON-RELIABILITY CUMULATIVE-BINOMIAL PROGRAM

ERNEST SCHEUER, M. (Caltech), and PAUL N. BOWERMAN (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17557

Vol. 13, No. 5, P. 70

Cumulative-binomial computer program, CROSSER, one of set of three programs, calculates cumulative binomial probability distributions for arbitrary inputs. CROSSER, CUMBIN (NPO-17555), and NEWTONP (NPO-17556), used independently of one another. Point of equality between reliability of system and common reliability of components found. Used by statisticians and users of statistical procedures, test planners, designers, and numerical analysts. Program written in C.

B89-10246

LINE-EDITOR COMPUTER PROGRAM

PETER J. SCOTT (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17300

Vol. 13, No. 5, P. 71

ZED editing program for DEC VAX computer simple, powerful line editor for text, program source code, and nonbinary data. Excels in processing of text by use of procedure files. Also features versatile search qualifiers, global changes, conditionals, online help, hexadecimal mode, space compression, looping, logical combinations of search strings, journaling, visible control characters, and automatic detabbing. Users of Cambridge implementation devised such ZED procedures as chess games, calculators, and programs for evaluating pi. Written entirely in C.

B89-10247

EXAMINING THE SUBROUTINE STRUCTURE OF A VAX IMAGE

PETER J. SCOTT (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17298

Vol. 13, No. 5, P. 71

Command program analyzes executable components of another program. SCANEXE, a command program for DEC VAX computer used to scan VMS run-time image and print information about

routines it uses. Lists each routine, with entry point, and how many times called. Information on progress of program printed at user's option as analyzing various executable components. Relies on 'debug' records included by default in '.EXE' files. If image linked with '/NOTRACEBACK' option, cannot provide necessary information. Written in C (83 percent), FORTRAN 77 (13 percent), and Assembler (4 percent).

B89-10248

MEDICAL-INFORMATION-MANAGEMENT SYSTEM

SIDNEY ALTERESCU, CARL A. FRIEDMAN, and JAMES W. FRANKOWSKI

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13198

Vol. 13, No. 5, P. 72

Medical Information Management System (MIMS) computer program interactive, general-purpose software system for storage and retrieval of information. Offers immediate assistance where manipulation of large data bases required. User quickly and efficiently extracts, displays, and analyzes data. Used in management of medical data and handling all aspects of data related to care of patients. Other applications include management of data on occupational safety in public and private sectors, handling judicial information, systemizing purchasing and procurement systems, and analyses of cost structures of organizations. Written in Microsoft FORTRAN 77.

B89-10249

AUTOCAD-TO-GIFTS TRANSLATOR PROGRAM

ANDREW JONES

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13211

Vol. 13, No. 5, P. 72

AutoCAD-to-GIFTS translator program, ACTOG, developed to facilitate quick generation of small finite-element models using CASA/GIFTS finite-element modeling program. Reads geometric data of drawing from Data Exchange File (DXF) used in AutoCAD and other PC-based drafting programs. Geometric entities recognized by ACTOG include points, lines, arcs, solids, three-dimensional lines, and three-dimensional faces. From this information, ACTOG creates GIFTS SRC file, which then reads into GIFTS preprocessor BULKM or modified and reads into EDITM to create finite-element model. SRC file used as is or edited for any number of uses. Written in Microsoft Quick-Basic (Version 2.0).

B89-10250

SIMULATION OF FAILURES AND REPAIRS

ANTONIO VALLONE (Computer Sciences Corp.), and JACK P. CRAIG (Computer Sciences Corp.)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13997

Vol. 13, No. 5, P. 73

Automated Reliability/Availability/Maintainability (ARAM) computer program one of software tools designed to assess candidate architectures of data-management system of the Space Station. Evaluates reliability, availability, and maintainability characteristics of conceptual system. Uses data representing redundancy and maintainability characteristics of system, and reliability parameters of components of equipment. Design based upon simulation of failures and possible subsequent repairs of each unit of equipment included in system. Analyzes effects of failures and repairs on system and maintains statistics of behavior of system from which results of simulation obtained. Written for IBM PC XT/AT or compatible computer.

B89-10268**PATH-FOLLOWING SOLUTIONS OF NONLINEAR EQUATIONS**
RAYMOND L. BARGER, and ROBERT W. WALTERS (Virginia Polytechnic Inst. and State Univ.)

May 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-14054)

LAR-13750**Vol. 13, No. 5, P. 90**

Report describes some path-following techniques for solution of nonlinear equations and compares with other methods. Use of multipurpose techniques applicable at more than one stage of path-following computation results in system relatively simple to understand, program, and use. Comparison of techniques with method of parametric differentiation (MPD) reveals definite advantages for path-following methods. Emphasis in investigation on multiuse techniques being applied at more than one stage of path-following computation. Incorporation of multipurpose techniques results in concise computer code relatively simple to use.

B89-10269**NOISELESS CODING OF MAGNETOMETER SIGNALS**

ROBERT F. RICE (Caltech), and JUN-JI LEE (Caltech)

May 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17320**Vol. 13, No. 5, P. 92**

Report discusses application of noiseless data-compression coding to digitized readings of spaceborne magnetometers for transmission back to Earth. Objective of such coding to increase efficiency by decreasing rate of transmission without sacrificing integrity of data. Adaptive coding compresses data by factors ranging from 2 to 6.

B89-10303**DATA-Dictionary-EDITING PROGRAM**

A. P. CUMMING (McDonnell-Douglas Corp.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21290**Vol. 13, No. 6, P. 70**

Access to data-dictionary relations and attributes made more convenient. Data Dictionary Editor (DDE) application program provides more convenient read/write access to data-dictionary table ('descriptions table') via data screen using SMARTQUERY function keys. Provides three main advantages: (1) User works with table names and field names rather than with table numbers and field numbers, (2) Provides online access to definitions of data-dictionary keys, and (3) Provides displayed summary list that shows, for each datum, which data-dictionary entries currently exist for any specific relation or attribute. Computer program developed to give developers of data bases more convenient access to the OMNIBASE VAX/IDM data-dictionary relations and attributes.

B89-10304**AUTOCAD-TO-NASTRAN TRANSLATOR PROGRAM**

A. JONES

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13217**Vol. 13, No. 6, P. 70**

Program facilitates creation of finite-element mathematical models from geometric entities. AutoCAD to NASTRAN translator (ACTON) computer program developed to facilitate quick generation of small finite-element mathematical models for use with NASTRAN finite-element modeling program. Reads geometric data of drawing from Data Exchange File (DXF) used in AutoCAD and other PC-based drafting programs. Written in Microsoft Quick-Basic (Version 2.0).

B89-10330**CONTINUOUSLY-VARIABLE VERNIER SCALE**

IRVIN M. MILLER

Jun. 1989 No additional information available: For specific technical questions contact TU Officer at Center of origin.

LAR-13721**Vol. 13, No. 6, P. 98**

Easily fabricated device increases precision in reading graphical data. Continuously-variable vernier scale (CV VS) designed to provide greater accuracy to scientists and technologists in reading numerical values from graphical data. Placed on graph and used to interpolate coordinate value of point on curve or plotted point on figure within division on each coordinate axis. Requires neither measurement of line segments where projection of point intersects division nor calculation to quantify projected value. Very flexible device constructed with any kind of scale. Very easy to use, requiring no special equipment of any kind, and saves considerable amount of time if numerous points to be evaluated.

B89-10331**SOME PROTOCOLS FOR OPTICAL-FIBER DIGITAL COMMUNICATIONS**

CAVOUR YEH (University of California), and MARIO GERLA (University of California)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17333**Vol. 13, No. 6, P. 98**

One works best in heavy traffic, another, in light traffic. Three protocols proposed for digital communications among stations connected by passive taps to pair of uni-directional optical-fiber buses. Mediate round-robin, bounded-delay access to buses by all stations and particularly suited to fast transmission. Partly because transmission medium passive (no relay stations) and partly because protocols distribute control of network among all stations with provision for addition and deletion of stations (no control stations), communication network able to resist and recover from failures. Implicit token propagates in one direction on one bus and in opposite direction on other bus, minimizing interval of silence between end of one round and beginning of next.

B89-10332**ALGORITHM FOR OPTIMAL CONTROL OF LARGE STRUCTURES**

MOKTAR A. SALAMA (Caltech), JOHN A. GARBA (Caltech), and SENOL UTKU (Duke Univ.)

Jun. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16983**Vol. 13, No. 6, P. 99**

Cost of computation appears competitive with other methods. Problem to compute optimal control of forced response of structure with n degrees of freedom identified in terms of smaller number, r , of vibrational modes. Article begins with Hamilton-Jacobi formulation of mechanics and use of quadratic cost functional. Complexity reduced by alternative approach in which quadratic cost functional expressed in terms of control variables only. Leads to iterative solution of second-order time-integral matrix Volterra equation of second kind containing optimal control vector. Cost of algorithm, measured in terms of number of computations required, is of order of, or less than, cost of prior algorithms applied to similar problems.

B89-10333**IDEAL RESAMPLING OF DISCRETE SEQUENCES**

ANDREW B. WATSON

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-19100)

ARC-11719**Vol. 13, No. 6, P. 100**

Spectral information preserved to extent possible. Technique developed to shrink or expand discrete input sequence of numbers

into output sequence in manner preserving input spectrum up to Nyquist limit of smaller of two sequences. In case of expansion, technique also prevents introduction of spurious frequencies not present in input. While applicable to many kinds of data sampled at regular interval, particularly useful in processing and enhancement of images, where discrete sequences spatially ordered sets of picture-element brightness values. Image coarsened by resampling to reduce number of picture elements while preserving as much as possible of original image information. Used to generate intermediate images at small intervals between frames, thereby suppressing appearance of jerky motion caused by sudden jumps between frames at low frame rate.

B89-10334

**DESIGN OF COMBINED STOCHASTIC
FEEDFORWARD/FEEDBACK CONTROL**

NESIM HALYO (Information and Control Systems, Inc.)

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-25806)

LAR-13795

Vol. 13, No. 6, P. 103

Methodology accommodates variety of control structures and design techniques. In methodology for combined stochastic feedforward/feedback control, main objectives of feedforward and feedback control laws seen clearly. Inclusion of error-integral feedback, dynamic compensation, rate-command control structure, and like integral element of methodology. Another advantage of methodology flexibility to develop variety of techniques for design of feedback control with arbitrary structures to obtain feedback controller: includes stochastic output feedback, multiconfiguration control, decentralized control, or frequency and classical control methods. Control modes of system include capture and tracking of localizer and glideslope, crab, decrab, and flare. By use of recommended incremental implementation, control laws simulated on digital computer and connected with nonlinear digital simulation of aircraft and its systems.

B89-10335

**COMMERCIAL EXPERT-SYSTEM-BUILDING SOFTWARE
TOOLS**

WILLIAM B. GEVARTER

Jun. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-28281)

ARC-11757

Vol. 13, No. 6, P. 103

Report evaluates commercially-available expert-system-building tools in terms of structures, representations of knowledge, inference mechanisms, interfaces with developers and end users, and capabilities of performing such functions as diagnosis and design. Software tools commercialized derivatives of artificial-intelligence systems developed by researchers at universities and research organizations. Reducing time to develop expert system by order of magnitude compared to that required with such traditional artificial development languages as LISP. Table lists 20 such tools, rating attributes as strong, fair, programmable by user, or having no capability in various criteria.

B89-10336

**APPLICATION OF ARTIFICIAL INTELLIGENCE TO WIND
TUNNELS**

CHING F. LO, and FRANK W. STEINLE, JR.

Jun. 1989 Additional information available through: AIAA Technical Information Service Library, 555 West 57th Street, New York, NY 10019 (Tel:212-247-6500) (A88-22141)

ARC-12229

Vol. 13, No. 6, P. 103

Report discusses potential use of artificial-intelligence systems to manage wind-tunnel test facilities at Ames Research Center. One of goals of program to obtain experimental data of better quality and otherwise generally increase productivity of facilities. Another goal to increase efficiency and expertise of current personnel and to retain expertise of former personnel. Third goal to increase effectiveness of management through more efficient

use of accumulated data. System used to improve schedules of operation and maintenance of tunnels and other equipment, assignment of personnel, distribution of electrical power, and analysis of costs and productivity. Several commercial artificial-intelligence computer programs discussed as possible candidates for use.

B89-10383

**AUTOMATIC PARAMETRIC TESTING OF INTEGRATED
CIRCUITS**

GLENN A. JENNINGS (Caltech), and CESAR A. PINA (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16783

Vol. 13, No. 7, P. 85

Computer program for parametric testing saves time and effort in research and development of integrated circuits. Software system automatically assembles various types of test structures and lays them out on silicon chip, generates sequence of test instructions, and interprets test data. Employs self-programming software; needs minimum of human intervention. Adapted to needs of different laboratories and readily accommodates new test structures. Program codes designed to be adaptable to most computers and test equipment now in use. Written in high-level languages to enhance transportability.

B89-10384

EXPONENTIAL FINITE-DIFFERENCE TECHNIQUE

ROBERT F. HANDSCHUH (Army Aviation Research and Technology Activity)

Jul. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-24930)

LEW-14737

Vol. 13, No. 7, P. 85

Report discusses use of explicit exponential finite-difference technique to solve various diffusion-type partial differential equations. Study extends technique to transient-heat-transfer problems in one dimensional cylindrical coordinates and two and three dimensional Cartesian coordinates and to some nonlinear problems in one or two Cartesian coordinates.

B89-10385

**INVERSION OF JACOBIAN MATRIX FOR ROBOT
MANIPULATORS**

AMIR FIJANY (Caltech), and ANTAL K. BEJCZY (Caltech)

Jul. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17544

Vol. 13, No. 7, P. 88

Report discusses inversion of Jacobian matrix for class of six-degree-of-freedom arms with spherical wrist, i.e., with last three joints intersecting. Shows by taking advantage of simple geometry of such arms, closed-form solution of $Q=J^{-1}X$, which represents linear transformation from task space to joint space, obtained efficiently. Presents solutions for PUMA arm, JPL/Stanford arm, and six-revolute-joint coplanar arm along with all singular points. Main contribution of paper shows simple geometry of this type of arms exploited in performing inverse transformation without any need to compute Jacobian or its inverse explicitly. Implication of this computational efficiency advanced task-space control schemes for spherical-wrist arms implemented more efficiently.

B89-10423

RANGE FILTERING FOR NAVIGATION BY SATELLITE

RUSSELL PAIELLI

Aug. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-20257)

ARC-12106

Vol. 13, No. 8, P. 84

Less processing and storage of data needed. Mathematical

basis developed for Kalman filtering of sequential measurements of range from single-channel receiver in Global Positioning System (GPS) to each of several navigation satellites. Range filtering involves separate applications of kinematic Kalman tracking filter to measurements of signal from each satellite in use. State vector consists of pseudorange and time derivatives. Main advantages: simplification of tuning and decreases in required amounts of storage and processing of data for navigation in ships, airplanes, and ground vehicles.

B89-10424

GENERALIZED MULTIPLE-TRELLIS-CODED MODULATION

D. DIVSALAR (Caltech), and M. K. SIMON (Caltech)

Aug. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17321

Vol. 13, No. 8, P. 86

Generalized multiple-trellis-coded modulation technique combines multiple trellis coding (more than one channel symbol per trellis branch transmitted) with symmetrical M-ary phase-shift keying. Transmitter puts out k M-ary code symbols for every b input binary symbols. Throughout performances, b/k, of trellis-coded multiple-phase-shift-keying channels compared with computational cutoff rates, R_0 , of multiple-phase-shift keying. Performs better than conventional trellis-coded modulation technique, with no increase in complexity.

B89-10459

VARIABLE-METRIC ALGORITHM FOR CONSTRAINED OPTIMIZATION

JAMES D. FRICK (McDonnell-Douglas Corp.)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21275

Vol. 13, No. 9, P. 78

Variable Metric Algorithm for Constrained Optimization (VMACO) is nonlinear computer program developed to calculate least value of function of n variables subject to general constraints, both equality and inequality. First set of constraints equality and remaining constraints inequalities. Program utilizes iterative method in seeking optimal solution. Written in ANSI Standard FORTRAN 77.

B89-10490

DYNAMIC TRANSFERS OF TASKS AMONG COMPUTERS

HOWARD T. LIU (Caltech), and JOHN A. SILVESTER (University of Southern California)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17197

Vol. 13, No. 9, P. 114

Allocation scheme gives jobs to idle computers. Ideal resource-sharing algorithm should have following characteristics: Dynamics, decentralized, and heterogeneous. Proposed enhanced receiver-initiated dynamic algorithm (ERIDA) for resource sharing fulfills all above criteria. Provides method balancing workload among hosts, resulting in improvement in response time and throughput performance of total system. Adjusts dynamically to traffic load of each station.

B89-10491

NETWORK-CONTROL ALGORITHM

HAK-WAI CHAN (Caltech), and TSUN-YEE YAN (Caltech)

Sep. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17505

Vol. 13, No. 9, P. 116

Algorithm developed for optimal routing of packets of data

along links of multilink, multinode digital communication network. Algorithm iterative and converges to cost-optimal assignment independent of initial assignment. Each node connected to other nodes through links, each containing number of two-way channels. Algorithm assigns channels according to message traffic leaving and arriving at each node. Modified to take account of different priorities among packets belonging to different users by using different delay constraints or imposing additional penalties via cost function.

B89-10516

ATAM - AUTOMATED TRADE ASSESSMENT MODELING

ANTONIO VALLONE (Computer Sciences Corp.), MEI-ZONG WU (Computer Sciences Corp.), and KEITH HOGIE (Computer Sciences Corp.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13999

Vol. 13, No. 10, P. 55

Automated Trade Assessment Modeling program, ATAM, one of software tools designed to assess candidate architectures for data-management system of Space Station. Designed to discriminate among candidates having equally acceptable performance and reliability characteristics. Utilizes data base, defined by user, containing information on candidate architecture. Assesses such trade factors of system as weight, power consumption, and life-cycle cost. Produces detailed parameter assessments as well as single figure of merit for candidate architecture. Written in Microsoft FORTRAN.

B89-10517

NONLINEAR CURVE-FITTING PROGRAM

JOEL L. EVERHART, and FOROOZ F. BADAVIDI (PRC Kentron, Inc.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13934

Vol. 13, No. 10, P. 55

Nonlinear optimization algorithm helps in finding best-fit curve. Nonlinear Curve Fitting Program, NLINEAR, interactive curve-fitting routine based on description of quadratic expansion of $X(\text{sup } 2)$ statistic. Utilizes nonlinear optimization algorithm calculating best statistically weighted values of parameters of fitting function and $X(\text{sup } 2)$ minimized. Provides user with such statistical information as goodness of fit and estimated values of parameters producing highest degree of correlation between experimental data and mathematical model. Written in FORTRAN 77.

B89-10534

FURTHER RESULTS ON FINITE-STATE CODES

F. POLLARA (Caltech), K. M. CHEUNG (Caltech), and R. J. MCELIECE (Caltech)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17513

Vol. 13, No. 10, P. 72

New codes generated and analyzed. Report discusses application of general construction for finite-state (FS) codes to known block codes. Decoding algorithms and results of simulations discussed briefly. First, general construction applied to (24,12) Golay code. Next, general construction applied to (16,8) Nordstrom-Robinson code. Results presented as plots of bit-error probability versus ratio of bit energy to noise energy.

B89-10535

FACTORIZATION OF POSITIVE DEFINITE, BANDED HERMITIAN MATRICES

MOKTAR A. SALAMA (Caltech), SENOL UTKU (Duke Univ.), and

09 MATHEMATICS AND INFORMATION SCIENCES

ROBERT MELOSH (Duke Univ.)

Oct. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17130

Vol. 13, No. 10, P. 73

Report discusses application of Cholesky factorization algorithm to positive definite, banded Hermitian matrices. Begins by extending Cholesky factorization algorithm to cover uniformly-partitioned, banded, positive definite matrices of rank n that is real symmetric or Hermitian. Then two stratagems given for use of algorithm in concurrent-processing system in which N less than it has to be to enable factorization of matrix in as few serial steps as possible and where uniformly high efficiency expected from all processing elements. One of major purposes of this and related studies to maximize speedup and efficiency in system of concurrent-data-processing elements.

B89-10536

EFFECT OF NOISE IN THE IDEAL STATE RECONSTRUCTOR

MICHAEL E. POLITES

Oct. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N89-13994)

MFS-28382

Vol. 13, No. 10, P. 73

More measurements yield better estimate. Report discusses effects of measurement noise on system including linear, time-invariant plant of measurable inputs and known parameters and deterministic digital control subsystem governed by algorithm called 'ideal state reconstructor.' So named because in absence of noise, it exactly reconstructs vector representing state of plant, even without knowledge of initial state. Ideal state reconstructor adds no new states or eigenvalues to system; affects measurement equation only.

B89-10562

C LANGUAGE INTEGRATED PRODUCTION SYSTEM

G. RILEY, C. CULBERT, and F. LOPEZ

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21208 MSC-21467 MSC-21475

Vol. 13, No. 11, P. 56

CLIPS version 4.2 represents major revision of CLIPS code to organize better kernel and to lay groundwork for additional features in future. Includes rule compiler for run-time modules, integrated MicroEMACS editor and online help facility. Cross-reference tool expanded to provide style checking and automatic verification. DEC VAX version line oriented. PC and Macintosh versions each contain windowing variant of CLIPS as well as standard line-oriented version. Written in C.

B89-10585

ARTIFICIAL INTELLIGENCE CONTROLS TAPE-RECORDING SEQUENCE

URSULA M. SCHWUTTKER (Caltech), ROY M. OTAMURA (Caltech), and LAWRENCE J. ZOTTARELLI (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17700

Vol. 13, No. 11, P. 85

Developmental expert-system computer program intended to schedule recording of large amounts of data on limited amount of magnetic tape. Schedules recording using two sets of rules. First set incorporates knowledge of locations for recording of new data. Second set incorporates knowledge about issuing commands to recorder. Designed primarily for use on Voyager Spacecraft, also applicable to planning and sequencing in industry.

B89-10586

SIMULATION OF COMBAT WITH AN EXPERT SYSTEM

J. P. PROVENZANO (Caltech)

Nov. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17720

Vol. 13, No. 11, P. 85

Proposed expert system predicts outcomes of combat situations. Called 'COBRA', combat outcome based on rules for attrition, system selects rules for mathematical modeling of losses and discrete events in combat according to previous experiences. Used with another software module known as the 'Game'. Game/COBRA software system, consisting of Game and COBRA modules, provides for both quantitative aspects and qualitative aspects in simulations of battles. COBRA intended for simulation of large-scale military exercises, concepts embodied in it have much broader applicability. In industrial research, knowledge-based system enables qualitative as well as quantitative simulations.

B89-10609

XPQ/GCOS-8 SYSOUT INTERFACE SOFTWARE

FRANKLIN A. FLOHR (Honeywell Federal Systems, Inc.)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

KSC-11446

Vol. 13, No. 12, P. 47

Slave user program can obtain SYSOUT records and transfer them to remote device. XPQ/GCOS-8 SYSOUT interface software consists of modifications of GCOS-8 operating system. Includes application subroutine that enables XPQ remote-print software package as modified by LSOC to gain access to, read, and release data from GCOS-8 system output (SYSOUT) files. Contains slave subroutine RSYOT, site-unique Master Mode Entry (MME) processor, and alterations to GEOT, INIT, and System Macro modules for GCOS-8 SR3002/3003. RSYOT written in GCOS-8 Assembler.

B89-10610

PROGRAM FOR LOCAL-AREA-NETWORK ELECTRONIC MAIL

MICHAEL J. WEINER (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17745

Vol. 13, No. 12, P. 47

MailRoom is computer program for local-area network (LAN) electronic mail. Enables users of LAN to exchange electronically notes, letters, reminders, or any sort of communication via their computers. Links all users of LAN into communication circle in which messages created, sent, copied, printed, downloaded, uploaded, and deleted through series of menu-driven screens. Includes feature that enables users to determine whether messages sent have been read by receivers. Written in Microsoft QuickBasic.

B89-10611

PROPERTIES AND COEFFICIENT PROGRAM FOR THE CALCULATION OF THERMODYNAMIC DATA (PAC2)

B. J. MCBRIDE

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-10254

Vol. 13, No. 12, P. 48

Program calculates ideal gas thermodynamic properties for any species for which molecular constant data available, and offers user choice of methodologies for performing thermodynamic calculations. PAC2 updated to PAC4. Improvements include increased user friendliness and ability to extrapolate thermodynamic properties for gases to higher temperatures using Wilhoit's formulas.

B89-10616**EARTH RESOURCES LABORATORY APPLICATIONS SOFTWARE (ELAS)**

P. G. PENTON

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ERL-10013**Vol. 13, No. 12, P. 48**

ELAS modified to handle broad range of digital images, and now finding widespread application in medical imaging field. Many versions of ELAS condensed into v. 8.0, which is available for DEC VAX, CONCURRENT, and for UNIX environment.

B89-10617**LAND ANALYSIS SYSTEM (LAS)**

P. B. PEASE

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13075**Vol. 13, No. 12, P. 48**

Version 4.1 of LAS provides flexible framework for algorithm development and processing and analysis of image data. Over 500,000 lines of code enable image repair, clustering, classification, film processing, geometric registration, radiometric correction, and manipulation of image statistics.

B89-10619**NETWORK QUEUEING SYSTEM (NQS)**

B. KINGSBURY (Sterling Software)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-11750**Vol. 13, No. 12, P. 48**

Program provides batch and device queueing facilities for various computers networked in UNIX environment. Allows network manager to allocate and track resources across network without requiring user to specifically log in on remote target machines.

B89-10620**SEMI-MARKOV UNRELIABILITY RANGE EVALUATOR (SURE)**

R. W. BUTLER

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13789**Vol. 13, No. 12, P. 48**

Analysis tool for reconfigurable, fault-tolerant systems, SURE provides efficient way to calculate accurate upper and lower bounds for death state probabilities for large class of semi-Markov models. Calculated bounds close enough for use in reliability studies of ultrareliable computer systems. Written in PASCAL for interactive execution and runs on DEC VAX computer under VMS.

B89-10628**PARTITIONING AND PACKING EQUATIONS FOR PARALLEL PROCESSING**

DALE J. ARPASI, and EDWARD J. MILNER

Dec. 1989 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-19008), 'Partitioning And Packing Mathematical Simulation Models For Calculation On Parallel Computers'

LEW-14634**Vol. 13, No. 12, P. 60**

Algorithm developed to identify parallelism in set of coupled ordinary differential equations that describe physical system and to divide set into parallel computational paths, along with parts of solution proceeds independently of others during at least part of time. Path-identifying algorithm creates number of paths consisting of equations that must be computed serially and table that gives dependent and independent arguments and 'can start,' 'can end,'

and 'must end' times of each equation. 'Must end' time used subsequently by packing algorithm.

B89-10629**FREQUENCY ESTIMATION TECHNIQUES FOR HIGH DYNAMIC TRAJECTORIES**

V. A. VILNROTTER (Caltech), S. M. HINEDI (Caltech), and R. KUMAR (Caltech)

Dec. 1989 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17695**Vol. 13, No. 12, P. 62**

Report presents comparative study of four techniques for estimating frequency of sinusoidal signal received in presence of noise when transmitter and/or receiver experiencing very high dynamics. Four techniques involve approximate-maximum-likelihood estimator, extended Kalman filter, cross-product automatic frequency control loop, and digital phase locked loop, respectively. In numerical simulations, each technique applied to signal from transmitter maneuvering along common trajectory; performance of each examined to determine its useful operating range, and performances compared.

B90-10037**SYNCHRONIZATION TECHNIQUE FOR RECEPTION OF CODED DATA**

EHRDAD M. SHAHSHAHANI (Caltech), and LAIF SWANSON (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17037**Vol. 14, No. 1, P. 67**

Shortest sequence of bits likely to be filled with error bursts examined. Algorithm improves synchronization of frames of noisy binary-coded data signals after Viterbi decoding (recovery from 'inner' convolutional code used in transmission channel) and before Reed-Solomon or other decoding (recovery from 'outer' error-correcting block code). Based on comparisons of sequences of correct and erroneous Viterbi-decoded received bits with known marker sequence denoting beginning of frame of data. Does not require count of number of bits in received sequence disagreeing with corresponding bits in marker sequence.

B90-10038**SIMPLIFIED CORRECTION OF ERRORS IN REED-SOLOMON CODES**

T. K. TRUONG (Caltech), I. S. HSU (Caltech), W. L. EASTMAN (Mitre Corp.), and I. S. REED (University of Southern California)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17381**Vol. 14, No. 1, P. 68**

New decoder realized by simplified pipeline architecture. Simplified procedure for correction of errors and erasures in Reed-Solomon codes expected to result in simpler decoding equipment. Development widens commercial applicability of Reed-Solomon codes, used to correct bursts of errors in digital communication and recording systems. Improved decoder less complex. Made more regular, simple, and suitable for implementation in both VLSI and software.

B90-10039**MULTIPLE-TRELLIS-CODED MODULATION**

D. DIVSALAR (Caltech), and M. K. SIMON (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17100**Vol. 14, No. 1, P. 71**

Theoretical gain over simple multiple-phase-shift keying at least 2 to 3 decibels. Multiple-trellis-coded modulation scheme combined with M-ary modulation shows theoretically to yield asymptotic gains in performance over uncoded multiple-phase-shift keying, while employing symmetric multiple-phase-shift signal constellations and avoiding code catastrophe. Suitable for satellite and terrestrial-mobile/satellite communications or other communications requiring burst-error correction. Extended to such higher dimensional modulations as quadrature amplitude modulation.

B90-10040
SCHEDULING NONCONSUMABLE RESOURCES
 HARRY J. PORTA (Caltech)

Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16988 Vol. 14, No. 1, P. 72

Users manual describes computer program SWITCH that schedules use of resources - by appliances switched on and off and use resources while they are on. Plans schedules according to predetermined goals; revises schedules when new goals imposed. Program works by depth-first searching with strict chronological back-tracking. Proceeds to evaluate alternatives as necessary, sometimes interacting with user.

B90-10041
PERFORMANCES OF FIXED-LAG PHASE-SMOOTHING ALGORITHMS

RAJENDRA KUMAR (Caltech), and WILLIAM J. HURD (Caltech)
 Jan. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17202 Vol. 14, No. 1, P. 73

Report discusses performances of fixed-lag nonlinear smoothing algorithms applied to estimation of phase and frequency of sinusoidal carrier signal with process phase noise and additive observation phase noise. Algorithm of type considered functions as suboptimal filter operating on received signal. Algorithm developed for system in which signal sampled at discrete times. Process noise assumed to be Gaussian with zero mean and independent of observation noise. Nonlinear smoothing equations derived in customary matrix-and-vector forms.

B90-10078
FINITE-STATE CODES

F. POLLARA (Caltech), R. J. MCELIECE (Caltech), and K. ABDEL-GHAFFAR (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17285 Vol. 14, No. 2, P. 61

New class of codes with desirable properties constructed from block codes. Finite-state encoder is machine that has finite number of internal states. Receives k parallel information symbols and transmits n parallel code symbols at each clock pulse. Finite-state codes include both block and convolutional codes. Theory of finite-state codes used to study properties of error-correcting codes in general and to design new codes to various specifications.

B90-10079
ASSIGNMENT OF FINITE ELEMENTS TO PARALLEL PROCESSORS

MOKTAR A. SALAMA (Caltech), JON W. FLOWER (Caltech), and STEVE W. OTTO (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17371 Vol. 14, No. 2, P. 61

Elements assigned approximately optimally to subdomains. Mapping algorithm based on simulated-annealing concept used to minimize approximate time required to perform finite-element computation on hypercube computer or other network of parallel data processors. Mapping algorithm needed when shape of domain complicated or otherwise not obvious what allocation of elements to subdomains minimizes cost of computation.

B90-10080
ALGORITHM FOR CONTROL OF LARGE ANTENNA

ROBERT E. HILL (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17482 Vol. 14, No. 2, P. 64

Alternative position-error feedback modes provided. Modern control theory basis for computer algorithm used to control two-axis positioning of large antenna. Algorithm - incorporated into software of real-time control computer - enables rapid intertarget positioning as well as precise tracking (using one of two optional position-feedback modes) without need of human operator intervention. Control system for one axis of two-axis azimuth/elevation control system embodied mostly in software based on advanced control theory. System has linear properties of classical linear feedback controller. Performance described by bandwidth and linear error coefficients.

B90-10081
SOFTWARE FOR CLEAR-AIR DOPPLER-RADAR DISPLAY

BRUCE W. JOHNSTON (Wisconsin Univ., Stout)

Feb. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

KSC-11427 Vol. 14, No. 2, P. 69

System of software developed to present plan-position-indicator scans of clear-air Doppler radar station on color graphical cathode-ray-tube display. Designed to incorporate latest accepted standards for equipment, computer programs, and meteorological data bases. Includes use of Ada programming language, of 'Graphical-Kernel-System-like' graphics interface, and of Common Doppler Radar Exchange Format. Features include portability and maintainability. Use of Ada software packages produced number of software modules reused on other related projects.

B90-10082
REDUCING SPECKLE IN ONE-LOOK SAR IMAGES

K. S. NATHAN (Caltech), and J. C. CURLANDER (Caltech)

Feb. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17254 Vol. 14, No. 2, P. 70

Local-adaptive-filter algorithm incorporated into digital processing of synthetic-aperture-radar (SAR) echo data to reduce speckle in resulting imagery. Involves use of image statistics in vicinity of each picture element, in conjunction with original intensity of element, to estimate brightness more nearly proportional to true radar reflectance of corresponding target. Increases ratio of signal to speckle noise without substantial degradation of resolution common to multilook SAR images. Adapts to local variations of statistics within scene, preserving subtle details. Computationally simple. Lends itself to parallel processing of different segments of image, making possible increased throughput.

B90-10109
ALGEBRAIC GENERATION OF TWO-DIMENSIONAL GRIDS

ROBERT E. SMITH, and MICHAEL R. WIESE (Computer Sciences Corp.)

Mar. 1990 Additional information available through: NASA STI

Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13800

Vol. 14, No. 3, P. 69

Two-Boundary Grid Generation (TBGG) computer program applies interactive algebraic grid-generation technique in two dimensions. Incorporates algebraic equations that relate uniform rectangular computational domain to arbitrary physical domain. Hermite cubic interpolation performed between fixed, nonintersecting boundaries. Applied to variety of problems in which discrete techniques used to solve such partial differential equations as governing equations of fluid flow. Written in FORTRAN 77.

B90-10136

AUTONOMOUS-CONTROL CONCEPT FOR INSTRUMENT POINTING SYSTEM

EDWARD METTLER (Caltech), MARK H. MILMAN (Caltech), and DAVID S. BAYARD (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17521

Vol. 14, No. 3, P. 95

Integrated payload articulation and identification system (IPAIDS) is conceptual system to control aiming of instruments aboard spacecraft of proposed Earth Observation System (EOS). Principal features of concept include advanced control strategies intended to assure robustness of performance over wide range of uncertainties in characteristics of spacecraft and instrument system. Intended originally for application to spacecraft system, has potential utility on Earth for automatic control of autonomous (robotic) vehicles or of remote sensing systems.

B90-10137

AUTOMATIC MONITORING OF COMPLICATED SYSTEMS

URSULA M. SCHWUTTKE (Caltech)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17409

Vol. 14, No. 3, P. 100

Collection of computer programs developed for expert computer system performing complicated, tedious, and repetitive portions of analysis of telemetry data from spacecraft. Provides nonstop, accurate surveillance of incoming data, also frees operators to concentrate their expertise on unexpected abnormal operating conditions. When unable to explain discrepancies with certainty resulting from data out of synchronization or other false-alarm conditions, triggers alarm devices to request assistance from designated individuals. Concept useful in such terrestrial systems as production lines, power-distribution networks, chemical processes, large airplanes, and other assemblies of interdependent equipment.

B90-10138

SOFTWARE MODEL OF SOFTWARE-DEVELOPMENT PROCESS

CHI Y. LIN (Caltech), DEBRA J. SYNOTT (Caltech), and REUVEN R. LEVARY (Saint Louis Univ.)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17424

Vol. 14, No. 3, P. 100

Collection of computer programs constitutes software tool for simulation of medium- to large-scale software-development projects. Necessary to include easily identifiable and more-readily quantifiable characteristics like costs, times, and numbers of errors. Mathematical model incorporating these and other factors of dynamics of software-development process implemented in the Software Life Cycle Simulator (SLICS) computer program. Simulates dynamics of software-development process. In combination with input and output expert software systems and knowledge-based management software system, develops information for use in

managing large software-development project. Intended to aid managers in planning, managing, and controlling software-development processes by reducing uncertainties in budgets, required personnel, and schedules.

B90-10139

MARKOV CHAINS FOR TESTING REDUNDANT SOFTWARE

ALLAN L. WHITE, and JON A. SJOGREN (Army Avionics Research and Development Activity)

Mar. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13812

Vol. 14, No. 3, P. 101

Preliminary design developed for validation experiment that addresses problems unique to assuring extremely high quality of multiple-version programs in process-control software. Approach takes into account inertia of controlled system in sense it takes more than one failure of control program to cause controlled system to fail. Verification procedure consists of two steps: experimentation (numerical simulation) and computation, with Markov model for each step.

B90-10169

MAKING MOSAICS OF SAR IMAGERY

JOHN C. CURLANDER (Caltech), RONALD KWOK (Caltech), SHIRLEY S. PANG (Caltech), and AMY A. PANG (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17586

Vol. 14, No. 4, P. 58

Spaceborne synthetic-aperture-radar (SAR) images useful for mapping of planets and investigations in Earth sciences. Produces multiframe mosaic by combining images along ground track, in adjacent cross-track swaths, or in ascending and descending passes. Images registered with geocoded maps such as ones produced by MAPJTC (NPO-17718), required as input. Minimal intervention by operator required. MOSK implemented on DEC VAX 11/785 computer running VMS 4.5. Most subroutines in FORTRAN, but three in MAXL and one in APAL.

B90-10170

EXTRACTING GEOCODED IMAGES FROM SAR DATA

JOHN C. CURLANDER (Caltech), RONALD KWOK (Caltech), SHIRLEY S. PANG (Caltech), and AMY A. PANG (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17418

Vol. 14, No. 4, P. 59

SAR imagery automatically put onto map in desired projection. MAPJTC designed to rectify and transform standard image output of digital synthetic-aperture-radar (SAR) correlator into image registered with geocoded map, without manual tiepointing or other interaction with operator. Reduces procedure to two one-dimensional passes, thereby saving computer time. Program written in FORTRAN (84 percent), APAL (2 percent), and MAXL (14 percent).

B90-10171

VIRTUAL FRAME BUFFER INTERFACE PROGRAM

THOMAS L. WOLFE (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-16713

Vol. 14, No. 4, P. 59

Virtual Frame Buffer Interface program makes all frame buffers appear as generic frame buffer with specified set of characteristics, allowing programmers to write codes that run unmodified on all supported hardware. Converts generic commands to actual device

commands. Consists of definition of capabilities and FORTRAN subroutines called by application programs. Developed in FORTRAN 77 for DEC VAX 11/780 or DEC VAX 11/750 computer under VMS 4.X.

B90-10191
DIFFERENTIAL SAMPLING FOR FAST ACQUISITION OF FREQUENCY

RAJENDRA KUMAR (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17358 Vol. 14, No. 4, P. 79

Algorithm rapidly estimates frequency of sinusoidal signal corrupted by zero-mean, additive, white Gaussian noise. Incorporates differential mathematical model of signal, cyclic sampling of signal, and least-squares best-estimate criterion. Adapts to changing signal frequency. Amount of computation required to obtain estimate increases only linearly with number of successive measurements processed.

B90-10192
OPTIMAL ALLOCATION OF TASKS IN HYPERCUBE COMPUTERS

MOKTAR A. SALAMA (Caltech), and CAMILLE C. PRICE (Stephen S. Austin State Univ.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17215 Vol. 14, No. 4, P. 79

Uniform tasks distributed uniformly or else assigned to one processor. Investigation in theory of scheduling yielded optimal scheme for allocation of tasks among digital data processors in hypercube ensemble. Applies to tasks that require equal time to execute, performed in any order, and between any two of which equal amounts of communication required. Reduces overall processing time for given set of computational tasks.

B90-10193
COMPUTER-ACCESS-CODE MATRICES

EARL R. COLLINS, JR. (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17525 Vol. 14, No. 4, P. 82

Authorized users respond to changing challenges with changing passwords. Scheme for controlling access to computers defeats eavesdroppers and 'hackers'. Based on password system of challenge and password or sign, challenge, and countersign correlated with random alphanumeric codes in matrices of two or more dimensions. Codes stored on floppy disk or plug-in card and changed frequently. For even higher security, matrices of four or more dimensions used, just as cubes compounded into hypercubes in concurrent processing.

B90-10194
DETERMINING SENSE OF MOTION IN ROBOTIC VISION

TERI B. LAWTON (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17552 Vol. 14, No. 4, P. 84

Image-processing algorithms based partly on natural visual/mental processes. Proposed digital image-processing scheme determines sense of motion of object in image along one coordinate axis (left to right or right to left) with respect to background in image. Image encoded by passing it through spatiotemporal filters, including nonlinear contrast function with

threshold. Nonlinear response to sums and differences of imagery processed through even and odd spatial filters indicates sense of motion.

B90-10195
FINDING OPTIMAL GAINS IN LINEAR-QUADRATIC CONTROL PROBLEMS

MARK H. MILMAN (Caltech), and ROBERT E. SCHEID, JR. (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17011 Vol. 14, No. 4, P. 87

Analytical method based on Volterra factorization leads to new approximations for optimal control gains in finite-time linear-quadratic control problem of system having infinite number of dimensions. Circumvents need to analyze and solve Riccati equations and provides more transparent connection between dynamics of system and optimal gain.

B90-10196
COMPUTER SIMULATION FOR MULTILEVEL OPTIMIZATION OF DESIGN

SHARON L. PADULA, and JAROSLAW SOBIESZCZANSKI-SOBIESKI

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13850 Vol. 14, No. 4, P. 87

New simulator for multilevel optimization of complex hierarchical systems reduces cost of analysis in experimentation with multilevel design-optimization algorithms. Computer program mimics qualitative behavior and data couplings that occur among subsystems of complex engineering system, such as car, aircraft, or building. Eliminates engineering analyses in subsystems by replacing them with judiciously-chosen analytical functions. Serves as tool for development of strategy for multilevel optimization of design.

B90-10197
NUMERICAL MODELS FOR CONTROL OF ROBOTS

MARY S. WAGGENER (Advanced Control Technology, Inc.)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28360 Vol. 14, No. 4, P. 88

Algorithm develops numerical models of kinematics of robots for use in directing movements of robots. Based on empirical data. Predicts movements from previous measurements of actual movements. Replaces analytical or iterative models used commonly.

B90-10198
RECURSIVE CONSTRUCTION OF JACOBIAN MATRIX AND ITS TIME DERIVATIVE FOR ROBOT ARM

KENNETH K. KREUTZ (Caltech)

Apr. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17364 Vol. 14, No. 4, P. 89

Report discusses recursive calculation of Jacobian matrix (J) and derivative of matrix with respect to time (J-dot) for robot arm that has multiple rotary joints. Such calculations used for implementation of linearizing feedback in digital control system for arm.

B90-10251**PYRAMIDAL IMAGE-PROCESSING CODE FOR HEXAGONAL GRID**

ANDREW B. WATSON, and ALBERT J. AHUMADA, JR.

May 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-14630)'An Orthogonal Oriented Quadrature Hexagonal Image Pyramid'

ARC-12178**Vol. 14, No. 5, P. 91**

Algorithm based on processing of information on intensities of picture elements arranged in regular hexagonal grid. Called 'image pyramid' because image information at each processing level arranged in hexagonal grid having one-seventh number of picture elements of next lower processing level, each picture element derived from hexagonal set of seven nearest-neighbor picture elements in next lower level. At lowest level, fine-resolution of elements of original image. Designed to have some properties of image-coding scheme of primate visual cortex.

B90-10252**STOCHASTIC FEEDFORWARD CONTROL TECHNIQUE**

NESIM HALYO (Information and Control Systems, Inc.)

May 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N87-25806)

LAR-13796**Vol. 14, No. 5, P. 92**

Class of commanded trajectories modeled as stochastic process. Advanced Transport Operating Systems (ATOPS) research and development program conducted by NASA Langley Research Center aimed at developing capabilities for increases in capacities of airports, safe and accurate flight in adverse weather conditions including shear, winds, avoidance of wake vortexes, and reduced consumption of fuel. Advances in techniques for design of modern controls and increased capabilities of digital flight computers coupled with accurate guidance information from Microwave Landing System (MLS). Stochastic feedforward control technique developed within context of ATOPS program.

B90-10253**PIPELINE TIME- AND TRANSFORM-DOMAIN REED-SOLOMON DECODERS**

IN-SHEK HSU (Caltech), TRIEU-KIE TRUONG (Caltech), L. J. DEUTSCH (Caltech), E. H. SATORIUS (Caltech), and I. S. REED (University of Southern California)

May 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17510**Vol. 14, No. 5, P. 94**

Modification of decoding algorithms leads to simplified conceptual designs for time- and transform-domain Reed-Solomon (RS) decoders suitable for implementation as very-large-scale integrated (VLSI) circuits. New conceptual decoders determine simultaneously errata-locator and errata-evaluator polynomials as part of simplified scheme for corrections of errors and erasures in RS codes. Highly suitable for implementation in both VLSI circuitry and in software on general-purpose computer.

B90-10287**COMPUTING MASS PROPERTIES FROM AUTOCAD**

A. JONES

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13228**Vol. 14, No. 6, P. 68**

Mass properties of structures computed from data in drawings. AutoCAD to Mass Properties (ACTOMP) computer program developed to facilitate quick calculations of mass properties of structures containing many simple elements in such complex configurations as trusses or sheet-metal containers. Mathematically modeled in AutoCAD or compatible computer-aided design (CAD) system in minutes by use of three-dimensional elements. Written in Microsoft Quick-Basic (Version 2.0).

B90-10288**FLIGHT DYNAMICS ANALYSIS SYSTEM**

KEIJI TASAKI (Computer Sciences Corp.), LENDA JUN (Computer Sciences Corp.), and ED SEIDEWITZ (Computer Sciences Corp.)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13163**Vol. 14, No. 6, P. 70**

Flight Dynamics Analysis System (FDAS) collection of computer programs provides environment for configuration and study of Ada software. Designed to support flight-dynamics research and analysis activities concerning software models, algorithms, and techniques used within flight Dynamics Division at Goddard Space Flight Center. Assists analysts and programmers in building, testing, and evaluating applications software by providing integrated support system for modification and reconfiguration of software. Includes capability of assembling reusable software components into applications programs, and reconfiguring assembled program after partially or fully completed. Developed in Ada for use on DEC VAX computer operating under VMS 4.3 or higher and version 1.3 or higher of VAX Ada Compilation System (ACS).

B90-10305**SOFTWARE FOR DEVELOPMENT OF EXPERT SYSTEMS**

MARK L. JAMES (Caltech), and DAVID J. ATKINSON (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17536**Vol. 14, No. 6, P. 86**

Modular software system helps create efficient artificial-intelligence computer programs. STAR*TOOL system: Set of high-level software tools; assists programmers in creation of efficient knowledge-based software systems. Provides language and capabilities for compilation of application programs written in Common LISP. Features modularity enabling elimination of unnecessary capabilities from final application program and achieves greater computing performance. Runs on any computer that supports Common LISP and has sufficient memory. Provides programmer with necessary software tools to build wide variety of reasoning and inference engines for such applications as planning, diagnosis and analysis, and simulation.

B90-10306**CONNECTION PROTOCOL FOR MOBILE/SATELLITE COMMUNICATIONS**

HARRY H. TAN (Caltech), and TSUN-YEE YAN (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17735**Vol. 14, No. 6, P. 91**

Throughput increased by better resolution of competing simultaneous requests for connections. Improved protocol sorts out simultaneous competing requests by message-originating stations for connection to satellite transmission link of land-mobile/satellite digital communication system. Applies to multiple-channel packet-message system with synchronous timeslots on all channels. Communication system has Q channels. Transmissions of packets allowed to begin only at beginnings of timeslots. Provides, to all users, binary feedback information on state of channel - namely, whether or not there is collision - during each timeslot.

B90-10307**ALGORITHM SCHEDULES AIRPLANE LANDINGS**

ROBERT A. LUENBERGER

Jun. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-19424)'A Traveling-Salesman Based Approach to Aircraft Scheduling in the Terminal Area'

ARC-12197**Vol. 14, No. 6, P. 92**

09 MATHEMATICS AND INFORMATION SCIENCES

Algorithm schedules arrivals of airplanes to reduce average or overall landing delay. Rearranges order of landing according to weight class of each airplane. Limits extent of one rearrangement to avoid penalizing any airplane or category of airplanes.

B90-10308

MULTIVARIABLE PID CONTROLLER FOR ROBOTIC MANIPULATOR

HOMAYOUN SERAJI (Caltech), and MAHMOUD TAROKH (California Univ., San Diego)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17647

Vol. 14, No. 6, P. 93

Gains updated during operation to cope with changes in characteristics and loads. Conceptual multivariable controller for robotic manipulator includes proportional/derivative (PD) controller in inner feedback loop, and proportional/integral/derivative (PID) controller in outer feedback loop. PD controller places poles of transfer function (in Laplace-transform space) of control system for linearized mathematical model of dynamics of robot. PID controller tracks trajectory and decouples input and output.

B90-10309

METHOD FOR MODEL-REFERENCE ADAPTIVE CONTROL

HOMAYOUN SERAJI (Caltech)

Jun. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17717

Vol. 14, No. 6, P. 94

Relatively simple method of model-reference adaptive control (MRAC) developed from two prior classes of MRAC techniques: signal-synthesis method and parameter-adaption method. Incorporated into unified theory, which yields more general adaptation scheme.

B90-10350

MANAGING INFORMATION ON COSTS

ZOE A. TAULBEE (ECON, Inc.)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-28361

Vol. 14, No. 7, P. 61

Cost Management Model, CMM, software tool for planning, tracking, and reporting costs and information related to costs. Capable of estimating costs, comparing estimated to actual costs, performing 'what-if' analyses on estimates of costs, and providing mechanism to maintain data on costs in format oriented to management. Number of supportive cost methods built in: escalation rates, production-learning curves, activity/event schedules, unit production schedules, set of spread distributions, tables of rates and factors defined by user, and full arithmetic capability. Import/export capability possible with 20/20 Spreadsheet available on Data General equipment. Program requires AOS/VS operating system available on Data General MV series computers. Written mainly in FORTRAN 77 but uses SGU (Screen Generation Utility).

B90-10351

MANAGING MOBILE/SATELLITE PROPAGATION DATA

ANIL V. KANTAK (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17269

Vol. 14, No. 7, P. 62

'Data Management System for Mobile Satellite Propagation' software package collection of FORTRAN programs and UNIX shell scripts designed to handle huge amounts of data resulting

from mobile/satellite radio-propagation experiments. Data from experiments converted into standard and more useful forms. Software package contains program to convert binary format of data into standard ASCII format suitable for use with wide variety of computing-machine architectures. Written in either FORTRAN 77 or UNIX shell scripts.

B90-10352

CUMULATIVE POISSON DISTRIBUTION PROGRAM

PAUL N. BOWERMAN (Caltech), ERNEST M. SCHEUER (Caltech), and ROBERT NOLTY (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17714

Vol. 14, No. 7, P. 62

Overflow and underflow in sums prevented. Cumulative Poisson Distribution Program, CUMPOIS, one of two computer programs that make calculations involving cumulative Poisson distributions. Both programs, CUMPOIS (NPO-17714) and NEWTPOIS (NPO-17715), used independently of one another. CUMPOIS determines cumulative Poisson distribution, used to evaluate cumulative distribution function (cdf) for gamma distributions with integer shape parameters and cdf for $X(\text{sup}2)$ distributions with even degrees of freedom. Used by statisticians and others concerned with probabilities of independent events occurring over specific units of time, area, or volume. Written in C.

B90-10371

PIVOTAL-FUNCTION ASSESSMENT OF RELIABILITY OF SOFTWARE

KELLY J. HAYHURST

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13842

Vol. 14, No. 7, P. 107

Approach developed to establish utility of pivotal functions for estimation and prediction of reliability of software. Improved estimates of reliability with statistical confidence obtained when relatively few testing data available. Pivotal functions effective tools for determination of confidence limits for reliability of software and prediction limits for time to next failure. Provides exact confidence and prediction limits regardless of how many bugs found in software.

B90-10372

PROCEDURE FOR LABELING LINEAR FINITE-STATE CODES

KAR-MING CHEUNG (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17774

Vol. 14, No. 7, P. 107

Method for labeling state diagrams of linear finite-state codes developed. Simplifies implementation of encoder hardware. Used to label state diagram not completely connected to obtain linear finite-state code that has larger free distance.

B90-10373

SPACE INFORMATION FOR EDUCATORS

BILL ANDERSON, and DEAN MARTIN

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-27221

Vol. 14, No. 7, P. 108

Anyone with personal computer, modem, and telephone can obtain educational materials. Access to collection of NASA information, stored in computer in Huntsville, Alabama, obtained over telephone lines from computers in classrooms and homes. Available free of charge. Users must pay own telephone charges.

Data base offers information on following topics: NASA news; Research in aeronautics; Space exploration before Space Shuttle; Exploration with Space Shuttle and beyond; NASA and its centers; NASA educational services; Classroom materials; and Space program spinoffs. User communicates with Spacelink via almost any existing communication software. Simple keystrokes control display of documents on user's terminal.

B90-10374**PROBABILISTIC DETERMINATION OF MOTIONS OF ROBOTS**

J. BALARAM (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17738

Vol. 14, No. 7, P. 111

Heuristic-path-planner method reduces computing time. Probability of successful motion of robot through region of space obtained from geometric model and captures effects of objects in region and kinematics of robot arm. Information used to guide on-line search and results, in most cases, in successful determination of path within reasonably short time.

B90-10375**MINIMAL-INVERSION FEEDFORWARD-AND-FEEDBACK CONTROL SYSTEM**

HOMAYOUN SERAJI (Caltech)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17701

Vol. 14, No. 7, P. 111

Recent developments in theory of control systems support concept of minimal-inversion feedforward-and feedback control system consisting of three independently designable control subsystems. Applicable to the control of linear, time-invariant plant.

B90-10376**ALGORITHM FOR 'BANG-BANG' CONTROL LAWS**

JOHN TING-YUNG WEN (Caltech), and ALAN DESROCHERS (Rensselaer Polytechnic Institute)

Jul. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17603

Vol. 14, No. 7, P. 112

Switching times updated to minimize errors in final positions. Algorithm computes 'bang-bang' control laws for single- or multiple-input systems, both those describable by linear dynamical equations and those describable by nonlinear dynamical equations that are linear in control vectors. Algorithm needed because analytical solutions of 'bang-bang' control problems intractable for all but simplest systems.

B90-10410**DISPLAYING TEX FILES ON GRAPHICS TERMINALS**

PETER J. SCOTT (Caltech), and DAVID B. COONS (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17296

Vol. 14, No. 8, P. 51

Previewing of printouts saves time and paper. DVIVIEW program previews output from TeX on graphics terminals. Enables user to specify range of pages to be viewed, to change magnification of document, and to view each page in seven different modes affecting size and orientation of each page. Written in Pascal, FORTRAN, C, and Assembler.

B90-10411**COLLECTION OF SOFTWARE FOR COMPUTER GRAPHICS**

ERIC A. HIBBARD, and GEORGE MAKATURA (Sterling Software)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12350

Vol. 14, No. 8, P. 52

Ames Research Graphics System (ARCGRAPH) collection of software libraries and software utilities assisting researchers in generating, manipulating, and visualizing graphical data. Defines metafile format containing device-independent graphical data. File format used with various computer-graphics-manipulation and -animation software packages at Ames, including SURF (COSMIC Program ARC-12381) and GAS (COSMIC Program ARC-12379). Consists of two-stage 'pipeline' used to put out graphical primitives. ARCGRAPH libraries developed on VAX computer running VMS.

B90-10412**LEAST-SQUARES CURVE-FITTING PROGRAM**

ANIL V. KANTAK (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17819

Vol. 14, No. 8, P. 53

Least Squares Curve Fitting program, AKLSQF, easily and efficiently computes polynomial providing least-squares best fit to uniformly spaced data. Enables user to specify tolerable least-squares error in fit or degree of polynomial. AKLSQF returns polynomial and actual least-squares-fit error incurred in operation. Data supplied to routine either by direct keyboard entry or via file. Written for an IBM PC X/AT or compatible using Microsoft's Quick Basic compiler.

B90-10413**NEWTON/POISSON-DISTRIBUTION PROGRAM**

PAUL N. BOWERMAN (Caltech), and ERNEST M. SCHEUER (Caltech)

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17715

Vol. 14, No. 8, P. 53

NEWTPOIS, one of two computer programs making calculations involving cumulative Poisson distributions. NEWTPOIS (NPO-17715) and CUMPOIS (NPO-17714) used independently of one another. NEWTPOIS determines Poisson parameter for given cumulative probability, from which one obtains percentiles for gamma distributions with integer shape parameters and percentiles for $X(\text{sup}2)$ distributions with even degrees of freedom. Used by statisticians and others concerned with probabilities of independent events occurring over specific units of time, area, or volume. Program written in C.

B90-10427**BALANCING LOADS AMONG PARALLEL DATA PROCESSORS**

PAUL THOMAS BAFFES

Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21348

Vol. 14, No. 8, P. 67

Heuristic algorithm minimizes amount of memory used by multiprocessor system. Distributes load of many identical, short computations among multiple parallel digital data processors, each of which has its own (local) memory. Each processor operates on distinct and independent set of data in larger shared memory. As integral part of load-balancing scheme, total amount of space used in shared memory minimized. Possible applications include artificial neural networks or image processors for which 'pipeline' and vector methods of load balancing inappropriate.

B90-10428
SPECTRAL ANALYSIS OF LINEAR, SHIFT-INVARIANT INTERPOLANTS

DONALD L. LANSING, and STEPHEN K. PARK
 Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13751 Vol. 14, No. 8, P. 67

Method of analysis provides quantitative measure of reconstruction and interpolation performances of linear, shift-invariant interpolants. Criterion of performance based upon mean-square error of difference between sampled and reconstructed functions. Applicable to reconstruction algorithms used in processing of signals and images and to types of interpolants used in numerical analysis, computer-aided design, and computer graphics.

B90-10429
TRUNCATION OF IMAGES FOR CORRELATION

KATSUNORI SHIMADA (Caltech)
 Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17847 Vol. 14, No. 8, P. 68

Correlation performed on relatively small computer. Proposed method for processing video images in slowly changing scenes, renditions of complicated objects truncated to points, lines, polygons, or other simplified geometrical objects. Processed by image-correlating algorithms to extract information: recognize features and to track displacements of features in subsequent image frames to determine velocities. Entails correlation of far fewer data than original images.

B90-10430
LAWS FOR STABLE CONTROL OF ORIENTATION

KENNETH K. KREUTZ (Caltech), and JOHN TING-YUNG WEN (Rensselaer Polytechnic Inst.)
 Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17790 Vol. 14, No. 8, P. 69

Class of globally stable laws for control of orientation of rigid body established. Tradeoffs made among complexity, performance, and information available for mathematical models. New approach involves use of globally nonsingular four-parameter unit-quaternion (Euler-parameter) representation. Attitude dynamics described by nonlinear Euler equation together with nonlinear kinematic equations, which relate representation of attitude to angular velocity of body. Suitable energy-motivated Lyapunov function to analyze stability.

B90-10431
AVERAGING SAMPLED SENSOR OUTPUTS TO DETECT FAILURES

HAGOP V. PANOSSIAN (Rockwell International Corp.)
 Aug. 1990 No additional information available: For specific technical questions contact TU Officer at Center of origin.

MFS-29719 Vol. 14, No. 8, P. 70

Fluctuating signals smoothed by taking consecutive averages. Sampling-and-averaging technique processes noisy or otherwise erratic signals from number of sensors to obtain indications of failures in complicated system containing sensors. Used under both transient and steady-state conditions. Useful in monitoring automotive engines, chemical-processing plants, powerplants, and other systems in which outputs of sensors contain noise or other fluctuations in measured quantities.

B90-10432
ORGANIZING PERFORMANCE REQUIREMENTS FOR DYNAMICAL SYSTEMS

HARVEY L. MALCHOW (Draper (Charles Stark) Lab, Inc.), and STEVEN R. CROOPNICK (Draper (Charles Stark) Lab, Inc.)
 Aug. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21235 Vol. 14, No. 8, P. 72

Paper describes methodology for establishing performance requirements for complicated dynamical systems. Uses top-down approach. In series of steps, makes connections between high-level mission requirements and lower-level functional performance requirements. Provides systematic delineation of elements accommodating design compromises.

B90-10497
PHASE CALIBRATION OF RADAR POLARIMETRIC DATA

HOWARD A. ZEBKER (Caltech), and YUNLING LOU (Caltech)
 Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17844 Vol. 14, No. 9, P. 91

Technique for phase calibration of data acquired by airborne imaging radar polarimeter based on extraction of calibration parameters from data themselves. Enables use of data-compression technique to reduce volume of data in synthetic-aperture-radar correlator. Typical radar polarimeter includes transmitting and receiving channels for horizontally and vertically polarized signals. Phase delay in each channel usually known only approximately if at all. Consequently, necessary to phase-calibrate radar return signals.

B90-10498
EXPONENTIALLY STABILIZING ROBOT CONTROL LAWS

JOHN T. WEN (Caltech), and DAVID S. BAYARD (Caltech)
 Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17587 Vol. 14, No. 9, P. 95

New class of exponentially stabilizing laws for joint-level control of robotic manipulators introduced. In case of set-point control, approach offers simplicity of proportion/derivative control architecture. In case of tracking control, approach provides several important alternatives to completed-torque method, as far as computational requirements and convergence. New control laws modified in simple fashion to obtain asymptotically stable adaptive control, when robot model and/or payload mass properties unknown.

B90-10499
CONCURRENT ALGORITHM FOR PARTICLE-IN-CELL SIMULATIONS

PAULETT C. LIEWER (Caltech), and VIKTOR K. DECYK (California State Univ., Los Angeles)
 Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17737 Vol. 14, No. 9, P. 95

Separate decompositions used for particle-motion and field calculations. General Concurrent Particle-in-Cell (GCPIC) algorithm used to implement motions of individual plasma particles (ions and electrons) under influence of particle-in-cell (PIC) computer codes on concurrent processors. Simulates motions of individual plasma particles under influence of electromagnetic fields generated by particles themselves. Performed to study variety of nonlinear problems in plasma physics, including magnetic and inertial fusion, plasmas in outer space, propagation of electron and ion beams, free-electron lasers, and particle accelerators.

B90-10500**EXACT LINEARIZATION FOR CONTROL OF ROBOTS**

KENNETH K. KREUTZ (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17363**Vol. 14, No. 9, P. 97**

Equivalence of several theoretical approaches discussed. Report comments on application of geometric control theory (GCT), resolved-acceleration control (RAC), operational-space control (OSC), and nonlinear-decoupling theory (NDT) to remote manipulator consisting of multiple rigid links. Principal concern, search for nonlinear feedback law making end effector behave, for purposes of control, as though its dynamics linear and decoupled.

B90-10501**NON-LIPSCHITZIAN DYNAMICS FOR MODELING NEURAL NETWORKS**

MICHAEL ZAK (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17814**Vol. 14, No. 9, P. 97**

Theoretical study explores failure of Lipschitz condition at points of unstable equilibrium in some dynamical systems.

B90-10502**BALANCING LOADS AMONG ROBOTIC-MANIPULATOR ARMS**

KENNETH K. KREUTZ (Caltech), and ANATOLE LOKSHIN (Caltech)

Sep. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17649**Vol. 14, No. 9, P. 98**

Paper presents rigorous mathematical approach to control of multiple robot arms simultaneously grasping one object. Mathematical development focuses on relationship between ability to control degrees of freedom of configuration and ability to control forces within grasped object and robot arms. Understanding of relationship leads to practical control schemes distributing load more equitably among all arms while grasping object with proper nondamaging forces.

B90-10539**COMMUNICATION-GATEWAY SOFTWARE FOR NETEX, DECNET, AND TCP/IP**

B. KEITH, D. FERRY (Computer Science Corp.), and E. FENDLER (Computer Science Corp.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-13236**Vol. 14, No. 10, P. 77**

Communications gateway software, GATEWAY, provides process-to-process communication between remote applications programs in different protocol domains. Communicating peer processes may be resident on any paired combination of NETEX, DECnet, or TCP/IP hosts. Provides necessary mapping from one protocol to another and facilitates practical intermachine communications in cost-effective manner by eliminating need to standardize on single protocol or to implement multiple protocols in host computers. Written in Ada.

B90-10540**PROGRAM MANIPULATES PLOTS FOR EFFECTIVE DISPLAY**

F. BAUER, and J. DOWNING

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore,

MD. 21240-0757

GSC-13232**Vol. 14, No. 10, P. 78**

Windowed Observation of Relative Motion (WORM) computer program primarily intended for generation of simple X-Y plots from data created by other programs. Enables user to label, zoom, and change scales of various plots. Three-dimensional contour and line plots provided. Written in PASCAL.

B90-10560**PROCESSING LASER-VELOCIMETRIC DATA BY VECTOR SCANNING**

MARK P. WERNET

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LEW-14925**Vol. 14, No. 10, P. 98**

Velocity plots obtained in minutes instead of hours. Velocity scanning technique for processing flow-field data from pulsed-laser-velocimetry images into two-dimensional velocity-vector maps. Requires no special equipment other than charge-coupled-device (CCD) camera, circuitry to digitize output of camera, and computer. Once image data digitized, all processing done in computer.

B90-10561**CONCURRENT FINITE-ELEMENT ANALYSIS ON HYPERCUBE COMPUTERS**

G. A. LYZENGA (Caltech), A. RAEFSKY (Caltech), and B. NOUR-OMID (Lockheed Aircraft Co.)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17602**Vol. 14, No. 10, P. 100**

Improved approach to execution of finite-element codes on hypercube and similar concurrent data processors increases efficiency of computation for many different types of problems. Based on flexible general model of computation on, and communication among, large-node parallel processors. Hybrid combining direct methods within subdomains and preconditioned-conjugate-gradient (PCG) iteration on remaining boundary system to obtain method of solution both robust and efficient. Preserves general structure and function of conventional sequential finite-element-method software. Generalized to both distributed- and shared-memory multicomputers, eliminating degree of machine specificity restricting general usefulness.

B90-10562**INDICATOR FOR PSEUDOMONAS BACTERIA**

RUTH MARGALIT (Caltech)

Oct. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17653**Vol. 14, No. 10, P. 101**

Characteristic protein extracted and detected. Natural protein marker found in Pseudomonas bacteria. Azurin, protein containing copper readily extracted, purified, and used to prepare antibodies. Possible to develop simple, fast, and accurate test for marker carried out in doctor's office.

B90-10590**SCHEDULE-REPORT-GENERATOR COMPUTER PROGRAM**

FERNANDO F. COLLAZO (Rockwell International Corp.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21527**Vol. 14, No. 11, P. 68**

Schedule Report Generator provides simple method for generating periodic schedule reports. Enables engineering manager

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to monitor tasks assigned to staff members on weekly basis. Sorts three types of reports by use of one or more data fields as sorting keys. Schedule Organizer (SO) (COSMIC program MSC-21525), Schedule Tracker (ST) (COSMIC program MSC-21526), and Schedule Report Generator (SRG) computer programs manipulating data-base files in ways advantageous in scheduling. Written in PL/1 and DEC Command Language (DCL).

B90-10591

SCHEDULE-ORGANIZER COMPUTER PROGRAM

FERNANDO F. COLLAZO (Rockwell International Corp.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21525

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Schedule Organizer provides simple method for generating distribution lists. Contains readers' names for each task schedule defined by input files. Schedule Organizer (SO), Schedule Tracker (ST) (COSMIC program MSC-21526), and Schedule Report Generator (SRG) (COSMIC program MSC-21527) computer programs manipulating data-base files in ways advantageous in scheduling. Written in PL/1 and DEC Command Language (DCL).

B90-10592

SCHEDULE-TRACKER COMPUTER PROGRAM

FERNANDO F. COLLAZO (Rockwell International Corp.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21526

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Schedule Tracker provides effective method for tracking tasks 'past due' and/or 'near term'. Generates reports for each responsible staff member having one or more assigned tasks falling within two listed categories. Schedule Organizer (SO) (COSMIC program MSC-21525), Schedule Tracker (ST), and Schedule Report Generator (SRG) (COSMIC program MSC-21527) computer programs manipulating data-base files in ways advantageous in scheduling. Written in PL/1 and DEC Command Language (DCL).

B90-10593

DOCUMENTING SOFTWARE AUTOMATICALLY

L. A. PIENIAZEK (TRW, Inc.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21297

Vol. 14, No. 11, P. 70

Automated Software Documentation Utility is package of software designed to provide automated drafts of manual documentation directly from compatible C source code in UNIX environment. Programs designed to simplify and streamline crucial yet often neglected chore of documentation of programs. Written in C and Unix Shell.

B90-10594

GENERATING SEMI-MARKOV MODELS AUTOMATICALLY

SALLY C. JOHNSON

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14193

Vol. 14, No. 11, P. 71

Abstract Semi-Markov Specification Interface to SURE Tool (ASSIST) program developed to generate semi-Markov model automatically from description in abstract, high-level language. ASSIST reads input file describing failure behavior of system in abstract language and generates Markov models in format needed for input to Semi-Markov Unreliability Range Evaluator (SURE) program (COSMIC program LAR-13789). Facilitates analysis of behavior of fault-tolerant computer. Written in PASCAL.

B90-10595

XTRN - AUTOMATIC CODE GENERATOR FOR C HEADER FILES

LESTER A. PIENIAZEK (TRW, Inc.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21298

Vol. 14, No. 11, P. 72

Computer program XTRN, Automatic Code Generator for C Header Files, generates 'extern' declarations for all globally visible identifiers contained in input C-language code. Generates external declarations by parsing input text according to syntax derived from C. Automatically provides consistent and up-to-date 'extern' declarations and alleviates tedium and errors involved in manual approach. Written in C and Unix Shell.

B90-10596

WINDOW UTILITY SYSTEM PROGRAM

ERIC G. COOPER (Planning Research Corp.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13993

Vol. 14, No. 11, P. 73

Window Utility System computer program provides full-featured screen-management windowing software facility incorporated easily into user application programs. Developed to provide more pleasing user interface for CLIPS, C-Language Integrated Production System expert-system-development shell program. Also used with many other application programs in VAX/VMS language. Provides pull-down menus and multiple window displays at minimal cost. Written in VAX C.

B90-10597

S-CHART - SCHEDULING-CHART PROGRAM

ERIC R. KLINKNER (Rockwell International Corp.)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29531

Vol. 14, No. 11, P. 74

Schedule Chart Program (S-Chart) produces quickly, through array of simple menu choices, high-quality Gantt-type scheduling and production time-line charts with minimal data-entry requirements. Significant features include: speed and ease of use with menu-driven selections from start to finish; storage and catalogs of all sets of data for rapid access and manipulation; compact program to permit storage of dozens of sets of data on program disk; and creation of ASCII text files of graphs for rapid printing. Written in ASCII code.

B90-10614

TRIGONOMETRIC POLYNOMIALS FOR ESTIMATION OF SPECTRA

CHARLES A. GREENHALL (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17885

Vol. 14, No. 11, P. 94

Orthogonal sets of trigonometric polynomials used as suboptimal substitutes for discrete prolate-spheroidal 'windows' of Thomson method of estimation of spectra. As used here, 'windows' denotes weighting functions used in sampling time series to obtain their power spectra within specified frequency bands. Simplified windows designed to require less computation than do discrete prolate-spheroidal windows, albeit at price of some loss of accuracy.

B90-10615

COOPERATING EXPERT SYSTEMS FOR AUTOMATED MONITORING AND DIAGNOSTICS

URSULA M. SCHWUTTKE (Caltech), and JOHN R. VEREGGE (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17804

Vol. 14, No. 11, P. 94

Human operators freer to perform nonrepetitive tasks. Expert software system for monitoring multiple streams of sensory data from interacting equipment subsystems undergoing development. Organized hierarchically to monitor multiple equipment subsystems simultaneously. Each expert software subsystem responsible for one of equipment subsystems. Intended to assist human analysts in interpretation of telemetry data indicating operating statuses of subsystems of spacecraft, enables analysts to maintain desired mode(s) of operation, and helps to correct anomalies in subsystems or in overall spacecraft system. Other versions devised for industrial monitoring and analysis tasks similarly complicated.

B90-10616

FORWARD STOCHASTIC NONLINEAR ADAPTIVE CONTROL METHOD

DAVID S. BAYARD (Caltech)

Nov. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17861

Vol. 14, No. 11, P. 95

New method of computation for optimal stochastic nonlinear and adaptive control undergoing development. Solves systematically stochastic dynamic programming equations forward in time, using nested-stochastic-approximation technique. Main advantage, simplicity of programming and reduced complexity with clear performance/computation trade-offs.

B90-10617

USING EXPERT SYSTEMS FOR COMPUTATIONAL TASKS

EUGENE L. DUKE, VICTORIA A. REGENIE, MARYLOUISE BRAZEE, and RANDAL W. BRUMBAUGH (PRC Kentron Inc.)

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N86-24687)'An Engineering Approach to the Use of Expert Systems Technology in Avionics Applications.'

ARC-12137

Vol. 14, No. 11, P. 96

Transformation technique enables inefficient expert systems to run in real time. Paper suggests use of knowledge compiler to transform knowledge base and inference mechanism of expert-system computer program into conventional computer program. Main benefit, faster execution and reduced processing demands. In avionic systems, transformation reduces need for special-purpose computers.

B90-10618

PRINCIPLES AND APPLICATIONS OF DUAL ADAPTIVE CONTROL

PURUSOTTAM MOOKERJEE (Connecticut Univ.)

Nov. 1990 Additional information available through: NTIS, Springfield, VA 22161 (Tel:703-487-4650) (N88-28038)'Dual Adaptive Control: Design Principles and Applications.'

ARC-12310

Vol. 14, No. 11, P. 98

Simulations indicate superiority of dual controller over 'cautious' controller. Report discusses principles of design of actively adaptive dual controllers. Focus is upon derivation of control laws for dual controller enhancing identification of parameters of mathematical model of multiple-input/multiple-output system, while controlling it at same time. Tasks of identification and control impose competing requirements.

B90-10643

SOFTWARE FOR LEAST-SQUARES AND ROBUST ESTIMATION

WILLIAM H. JEFFREYS (Texas Univ.), MICHAEL J. FITZPATRICK (Texas Univ.), BARBARA E. MCARTHUR (Texas Univ.), and JAMES MCCARTNEY (Texas Univ.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-26108

Vol. 14, No. 12, P. 40

GAUSSFIT computer program includes full-featured programming language facilitating creation of mathematical models solving least-squares and robust-estimation problems. Programming language designed to make it easy to specify complex reduction models. Written in 100 percent C language.

B90-10644

DESIGN-TRADEOFF MODEL FOR SPACE STATION

ROBERT G. CHAMBERLAIN (Caltech), JEFFREY L. SMITH (Caltech), CHESTER S. BORDEN (Caltech), GOVIND K. DESHPANDE (Caltech), GEORGE FOX (Caltech), WILLIAM H. DUQUETTE (Caltech), LARRY A. DILULLO (Caltech), LARRY SEELEY (Caltech), and ROBERT SHISHKO (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17878

Vol. 14, No. 12, P. 41

System Design Tradeoff Model (SDTM) computer program produces information which helps to enforce consistency of design objectives throughout system. Mathematical model of set of possible designs for Space Station Freedom. Program finds particular design enabling station to provide specified amounts of resources to users at lowest total (or life-cycle) cost. Compares alternative design concepts by changing set of possible designs, while holding specified services to users constant, and then comparing costs. Finally, both costs and services varied simultaneously when comparing different designs. Written in Turbo C 2.0.

B90-10645

AN ADA LINEAR-ALGEBRA SOFTWARE PACKAGE MODELED AFTER HAL/S

ALLAN R. KLUMPP (Caltech), and CHARLES L. LAWSON (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17985

Vol. 14, No. 12, P. 42

New avionics software written more easily. Software package extends Ada programming language to include linear-algebra capabilities similar to those of HAL/S programming language. Designed for such avionics applications as Space Station flight software. In addition to built-in functions of HAL/S, package incorporates quaternion functions used in Space Shuttle and Galileo projects and routines from LINPAK solving systems of equations involving general square matrices. Contains two generic programs: one for floating-point computations and one for integer computations. Written on IBM/AT personal computer running under PC DOS, v.3.1.

B90-10646

CYBER-205 DEVECTORIZER

CHRISTOPHER D. LAKEOTES (Computer Sciences Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-13810

Vol. 14, No. 12, P. 44

DEVECT (CYBER-205 Devectorizer) is CYBER-205 FORTRAN source-language-preprocessor computer program reducing vector statements to standard FORTRAN. In addition, DEVECT has many

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other standard and optional features simplifying conversion of vector-processor programs for CYBER 200 to other computers. Written in FORTRAN IV.

B90-10648 **INFORMATION SYSTEM LIFE-CYCLE AND DOCUMENTATION STANDARDS (SMAP DIDS)**

Innovator not given (Expertware)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

COS-10300 Vol. 14, No. 12, P. 44

Although not computer program, SMAP DIDS written to provide systematic, NASA-wide structure for documenting information system development projects. Each DID (data item description) outlines document required for top-quality software development. When combined with management, assurance, and life cycle standards, Standards protect all parties who participate in design and operation of new information system.

B90-10651 **GODDARD MISSION ANALYSIS SYSTEM (GMAS)**

F. E. MCGARRY

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

GSC-12392 Vol. 14, No. 12, P. 44

Written to simulate complex satellite orbits including attitude control and orbital maneuvers, GMAS also performs shadow and station coverage studies and graph-selected orbital parameters for two satellites. Written in FORTRAN and ASSEMBLER.

B90-10652 **THERMAL RADIATION ANALYSIS SYSTEM (TRASYS II)**

R. A. VOGT

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21030 Vol. 14, No. 12, P. 44

Program solves thermal heating problems such as effect of sunlight on satellite. Surface geometry features include complete shadowing ability, including shadowing by semi-transparent surfaces. Written for DEC VAX.

B90-10653 **C LANGUAGE INTEGRATED PRODUCTION SYSTEM (CLIPS)**

G. RILEY, C. CULBERT, and F. LOPEZ

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MSC-21208 Vol. 14, No. 12, P. 44

Ideal for developing expert systems, CLIPS language easy to use and called from or make calls to other programs. Advanced features include cross-reference, style, and verification facility catching logic errors in large systems. Program machine independent.

B90-10680 **SCALED ELLIPSES FOR COMPUTER-AIDED DESIGN**

ANTHONY J. SCHEMBRI (Rockwell International Corp.)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

MFS-29629 Vol. 14, No. 12, P. 64

An addition to CAD-PACK, computer-aided design program, speeds preparation of isometric drawings, particularly cutaway views showing bores and threads. Consists of set of 50 scaled

ellipses on detail pages of program. Designer selects ellipse, rotates it, and draws feature. Then erases reference lines on video screen.

B90-10681 **MINIMUM-TIME SLEWING OF SPACE INFRARED TELESCOPE**

N. RAJAN (Sterling Software)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

ARC-12155 Vol. 14, No. 12, P. 64

Report discusses formulation of algorithm used in pointing proposed Space Infrared Telescope Facility at various celestial objects. Control system of telescope required to aim and keep telescope aimed within 0.15 arc second of intended target. In addition, required to perform 120 degree slews in 8 min and 7.5-arc-minute nods (nod is small-angle slew) within 20 s. Study concentrates on nod maneuver.

B90-10682 **RANDOM-FIELD ESTIMATION FOR DYNAMICS OF ROBOTS**

GUILLERMO RODRIQUEZ (Caltech)

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

NPO-17788 Vol. 14, No. 12, P. 66

Report discusses use of random-field mathematical models as alternatives to deterministic models of classical mechanics to describe dynamics of robot arms. These alternative models used to establish relationship between methods of estimation theory and robot dynamics. Approach yields new class of algorithms performing computations typical of estimation theory to solve such fundamental problems in robotics as forward and inverse dynamics and inverse kinematics.

B90-10683 **LOCATING A PLANAR TARGET FROM AN IMAGE**

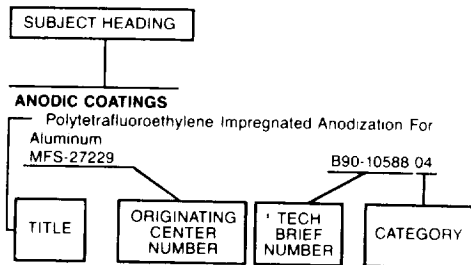
KARIN CORNILS, and PLESENT W. GOODE

Dec. 1990 Additional information available through: NASA STI Facility, Technology Utilization Office, P.O. Box 8757, Baltimore, MD. 21240-0757

LAR-14128 Vol. 14, No. 12, P. 66

Report describes experiments to test two algorithms being considered for use in automatic control of robots and remote manipulators. One algorithm based on quadrangle-projection method, which involves use of four target points lying at corners of quadrangle. Other algorithm based on elastic-matching ('rubber-mask') approach, in which reference image warped to conform to actual image. Both algorithms determine position and orientation of target with accuracy sufficient for consistent and efficient acquisition by telerobot.

Typical Subject Index Listing



The title of each Tech Brief is listed under several selected subject headings to provide the user with a variety of approaches in his search for specific information. The Tech Brief number is located under and to the right of the title and is followed by a two-digit number which designates the subject category in which the entire entry can be found.

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MFS-29064 B86-10090 08

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Acoustic Reduction Of Separation Of Flow
LEW-14876 B90-10481 06

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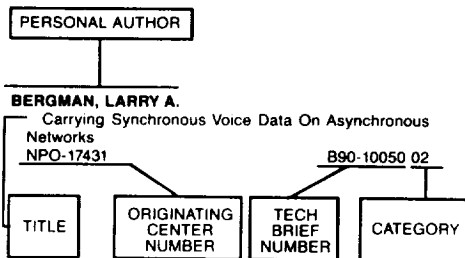
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NPO-16601 B86-10004 01
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NPO-16526 B86-10014 01
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NPO-16762 B87-10003 01
A Surface-Controlled Solar Cell
NPO-16430 B87-10055 01
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NPO-16810 B88-10505 08
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NPO-17124 B89-10017 03
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NPO-17398 B90-10045 01
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NPO-17579 B90-10141 01
- DAUGHERTY, ROBERT H.**
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LAR-14030 B90-10472 06
- DAUGHTRY, C.**
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MSC-21060 B86-10480 05
- DAVARIAN, F.**
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NPO-16414 B86-10317 02
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NPO-16447 B86-10318 02
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NPO-17165 B87-10555 09
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NPO-17234 B88-10565 02
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NPO-17252 B89-10052 02
- DAVARIAN, FARAMAZ**
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NPO-16800 B87-10187 02
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NPO-16659 B89-10057 02
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NPO-17021 B89-10058 02
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NPO-16788 B89-10167 02
- DAVENPORT, R. J.**
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MSC-20915 B87-10107 01
- DAVID, J.**
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LEW-14165 B86-10402 09
- DAVIDSON, GRANT**
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NPO-17131 B89-10547 02
- DAVIDSON, SHAYLA E.**
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MSC-21146 B87-10446 01
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MSC-21180 B87-10534 01
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MSC-21118 B88-10005 01
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MSC-21236 B88-10346 01
- DAVIS, C. O.**
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NPO-17608 B89-10493 05
- DAVIS, CURTISS O.**
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NPO-17645 B90-10102 03
- DAVIS, GARY A.**
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MFS-29334 B90-10115 06
- DAVIS, J. H.**
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MFS-27114 B88-10530 04
- DAVIS, JEFFREY A.**
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NPO-17178 B89-10114 02
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NPO-17614 B90-10507 01
- DAVIS, L. P.**
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MFS-28244 B89-10193 06

- DAVIS, MITCHELL L.**
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- DAVIS, PATRICIA P.**
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LAR-13741 B89-10559 04
- DAVIS, R. C.**
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LAR-13460 B86-10472 08
- DAVIS, R. M.**
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KSC-11367 B88-10169 02
- DAVIS, RANDALL C.**
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LAR-13506 B87-10227 04
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LAR-13438 B88-10065 08
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LAR-13814 B90-10033 08
- DAVIS, SANFORD S.**
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ARC-11748 B88-10122 06
- DAVIS, THOMAS J.**
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ARC-11674 B87-10318 02
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LAR-13439 B86-10212 02
- DAVISSON, M. C.**
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NPO-17042 B87-10536 01
- DAWN, FREDERIC S.**
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MSC-21067 B89-10321 08
- DAY, WILLIAM B.**
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MFS-26051 B88-10392 07
- DAYTON, JAMES**
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LEW-14926 B90-10442 01
- DE GROH, H.**
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LEW-14914 B90-10535 04
- DE KRAMER, CASEY**
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GSC-13068 B87-10287 06
- DE PAULA, RAMON P.**
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NPO-17242 B89-10175 03
- DE YOUNG, ANEMARIE**
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ARC-11547 B87-10222 03
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ARC-11679 B88-10095 03
- DEADMORE, D.**
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LEW-14595 B88-10239 04
- DEADMORE, D. L.**
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LEW-14362 B86-10428 02
- DEADMORE, DANIEL L.**
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LEW-14835 B90-10286 04
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LEW-14834 B90-10344 04
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LAR-13607 B88-10104 04
- DEBNAM, WILLIAM J., JR.**
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LAR-13597 B88-10091 03
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LAR-13670 B88-10413 03
- DECARLO, J. L.**
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MFS-28123 B87-10402 04
- DECKER, WILLIAM A.**
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NPO-17737 B89-10499 09
- DEERING, ROBERT M.**
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- DEESE, GARY E.**
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MFS-29234 B88-10198 08
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MFS-29598 B89-10578 08
- DEETS, DWAIN A.**
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ARC-11763 B88-10370 02
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MSC-21334 B89-10438 02
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- DEHAYE, R. F.**
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MFS-28036 B87-10009 03
- DEHNER, G. F.**
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MSC-20984 B87-10158 05
- DEININGER, W. D.**
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NPO-16576 B86-10026 02
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NPO-16992 B89-10403 03
- DEININGER, WILLIAM D.**
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NPO-17183 B89-10326 08
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NPO-17575 B90-10628 03
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LEW-14514 B88-10059 07
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LEW-14533 B88-10166 02
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LAR-13635 B87-10332 04
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KSC-11332 B88-10150 09
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MFS-29274 B88-10592 06
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MFS-29469 B89-10045 01
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LEW-14834 B90-10344 04
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LEW-14902 B90-10461 04
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LEW-13288 B86-10412 01
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MFS-26088 B89-10476 08
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MSC-18578 B86-10116 02
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NPO-17822 B90-10378 01
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NPO-16817 B87-10322 03
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NPO-17515 B90-10143 01
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MSC-21062 B86-10363 07
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LAR-13946 B88-10534 09
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GSC-12967 B87-10316 02
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NPO-17878 B90-10644 09
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NPO-16564 B86-10319 02
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NPO-17280 B90-10049 02
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NPO-17510 B90-10253 09
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NPO-16740 B87-10164 02
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NPO-16854 B88-10274 02
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GSC-13281 B90-10401 03
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LAR-13319 B86-10256 06
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MSC-20977 B86-10445 04
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NPO-16906 B87-10524 02
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NPO-17090 B89-10270 01
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LAR-13645 B90-10370 08
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KSC-11386 B88-10399 01
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MFS-28389 B90-10487 08
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NPO-16953 B89-10116 02
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LEW-14481 B88-10143 08
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LEW-14551 B88-10377 04
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LAR-13527 B86-10529 06
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NPO-17878 B90-10644 09
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NPO-16371 B88-10174 03
- DINH, K.**
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- DIRUSSO, E.**
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LEW-14488 B87-10293 07
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MSC-21257 B88-10264 01
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NPO-17425 B89-10540 01
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NPO-17604 B90-10163 03
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NPO-17491 B90-10586 04
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NPO-16987 B89-10218 02
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NPO-17778 B90-10630 03
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MSC-20460 B86-10222 04
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ARC-11634 B87-10455 03
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ARC-11679 B88-10095 03
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MFS-29116 B87-10207 08
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NPO-17585 B90-10254 05
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ARC-11731 B89-10014 02
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NPO-16879 B87-10521 02
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MFS-27096 B86-10088 08
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MFS-26096 B90-10295 07
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LAR-13587 B88-10391 07
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LEW-14637 B89-10212 01
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GSC-13232 B90-10540 09
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GSC-12998 B87-10231 02
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NPO-16412 B87-10089 07
- DOWNES, KARYN S.**
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MFS-28187 B87-10369 08
- DOYCHAK, JOSEPH**
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LEW-14755 B89-10290 03
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- DOZIER, JEFF**
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NPO-17624 B90-10096 02
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MSC-21462 B90-10065 06
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LEW-14877 B90-10550 07
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LAR-14040 B90-10678 08
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NPO-16605 B86-10461 07
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NPO-16985 B89-10316 07
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NPO-17271 B89-10035 08
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NPO-17272 B89-10036 08
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MFS-29084 B86-10522 08
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ARC-12196 B89-10466 06
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NPO-17055 B88-10259 08
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NPO-17137 B89-10393 02
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GSC-12996 B88-10515 01
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NPO-17878 B90-10644 09
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MFS-27096 B86-10088 08
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LAR-13876 B89-10184 06
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MSC-21272 B89-10078 06
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ARC-11494 B87-10181 04
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LEW-14309 B87-10065 03
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LEW-14193 B86-10128 04
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MFS-26033 B87-10271 03
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NPO-17381 B90-10038 09
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NPO-17716 B90-10212 02
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NPO-17564 B90-10259 01
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LEW-14454 B88-10260 08
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MFS-29501 B89-10297 04
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MFS-28372 B89-10606 04
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MSC-21388 B88-10617 05
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MFS-28146 B87-10270 03
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LEW-14551 B88-10377 04
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- LIN, JOHN C.**
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- LIN, S. H.**
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- LIN, TRUE-LON**
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- LIN, YU-HWAN**
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- LINABURG, E. L.**
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- LINCOLN, K. A.**
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- LINDSEY, CHRIS P.**
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- LING, A. C.**
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- LIRETTE, MURRAY J.**
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- LISEC, THOMAS R.**
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- LITTLE, BRUCE D.**
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- LITTLE, SALLY A.**
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- LITVIN, F. L.**
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- LITVIN, FAYDOR L.**
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- LITWIN, JOEL**
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- LIU, DAVID C.**
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- LIU, H. T.**
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- LIU, HOWARD T.**
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- LIU, HUA-KUANG**
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- LIU, JOHN L.**
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- LIU, KUANG Y.**
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- LIU, MATTHEW T.**
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- LIU, TSUEN-HSI**
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- LIU, W. Y. T.**
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- LLEWELIN, W.**
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- LLOYD, JAMES F.**
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- LO, CHING F.**
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- LO, ROGER Y.**
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- LOBB, V. B.**
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- LOCCI, IVAN E.**
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- LOCK, J. A.**
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- LOCK, WILTON P.**
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- LOCKE, J. R.**
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- LOCKWOOD, R.**
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- LOEWENTHAL, S. H.**
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- LOEWENTHAL, STUART H.**
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- LOFTIN, TIMOTHY A.**
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- LOGAN, PAMELA**
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- LOGGIARATO, D. DANIEL**
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- LOH, Y. C.**
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- LOKERSON, D. C.**
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- LOKSHIN, ANATOLE**
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- LOKSHIN, ANATOLY**
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- LOMBARDI, FRANK**
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- LONG, D. G.**
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- LONG, D.**
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- LONG, DAVID G.**
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- LONG, EDWARD R., JR.**
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- LONG, MARTIN**
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- LONG, STEPHEN I.**
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- LONGENECKER, KENT O.**
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- LOO, S.**
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- LOONEY, K. T.**
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- LOPEZ, FRANK**
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- LOPEZ, HIRAM**
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- LORD, CARTER K.**
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- LORD, MARK T.**
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- LORDEN, G.**
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- LORENZO, C. F.**
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- LOTGERING, GENE E.**
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- LOU, YUN-LING**
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- LOU, YUNLING**
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- LOUIE, ALEXANDER W.**
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- LOUREIRO, HENRY**
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- LOURENCO, L. M. M.**
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- LOVELAND, MARIA**
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- LOVELAND, R. C.**
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- LOWELL, C. E.**
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- LOWENTHAL, S.**
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- LOWRY, LYNN E.**
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- LOWTHER, SHARON E.**
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- LU, YUN-CHI**
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- LUCK, WILLIAM S., JR.**
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- LUECKE, G.**
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MFS-29582 B89-10592 01

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NPO-16905 B89-10437 02

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MSC-21177 B88-10134 08

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LAR-13436 B88-10053 06

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LAR-13463 B88-10430 06

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LEW-13969 B86-10015 01

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LEW-14369 B87-10214 01

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MFS-29064 B86-10090 08

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- MARELID, S.**
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NPO-17653 B90-10562 09
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NPO-17017 B89-10015 02
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NPO-17105 B88-10477 03
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MSC-21338 B89-10273 01
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NPO-16298 B89-10043 01
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NPO-17196 B88-10333 02
- Sonic Simulation of Near Projectile Hits
NPO-16943 B88-10464 02
- STATMAN, JOSEPH I.**
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NPO-17472 B90-10153 02
- STAVER, L. ROBERT**
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NPO-17201 B89-10458 06
- STEARNS, JOHN W.**
Alkali Metal/Salt Thermal-Energy-Storage Systems
NPO-16686 B87-10245 07
- STECKLEIN, J. M.**
Simulating Orbiting Spacecraft
MSC-21462 B90-10065 06
- Space Systems Integrated Simulation (SPASIS)
MSC-21462 B90-10654 06
- STECURA, STEPHAN**
Thermal-Barrier Coatings Containing Ytterbia
LEW-14057 B87-10326 04
- STEDMAN, RONALD S.**
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MSC-21574 B90-10569 01
- STEFANESCU, D. M.**
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MFS-25967 B86-10036 04
- Directional Solidification of Nodular Cast Iron
MFS-28015 B87-10323 04
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MFS-26080 B90-10460 03
- STEFFY, G.**
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NPO-16028 B86-10316 01
- STEGER, J. L.**
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ARC-11550 B86-10457 06
- Multiple Grids in Finite-Difference Flow Analysis
ARC-11491 B86-10524 09
- STEIN, B. A.**
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LAR-13277 B86-10083 08
- STEIN, J. A.**
Automatic-Control System for Safer Brazing
MSC-20881 B86-10394 08
- STEIN, RICHARD J.**
Optical Tracker For Longwall Coal Shearer
MFS-25717 B89-10251 06
- STEINETZ, B. M.**
Electromechanical Turboprop-Pitch-Control Mechanism
LEW-14234 B86-10181 07
- STEINETZ, BRUCE M.**
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LEW-14672 B89-10197 07
- STEINLE, FRANK W., JR.**
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ARC-12229 B89-10336 09
- STENSBY, JOHN L.**
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MFS-27110 B87-10454 02
- STEPHAN, E.**
Computer Program To Transliterate Into Arabic
KSC-11342 B86-10404 09
- STEPHENS, J. B.**
Toxic-Waste Disposal by Combustion in Containers
NPO-16710 B86-10375 07
- Toxic-Waste Disposal by Drain-in-Furnace Technique
NPO-16579 B86-10376 07
- STEPHENS, J. R.**
High-Temperature Alloys for Automotive Stirling Engines
LEW-14325 B86-10450 04
- STEPHENS, JAMES B.**
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NPO-16822 B87-10208 08
- Twisted Pair Of Insulated Wires Senses Moisture
NPO-17111 B89-10343 01
- STEPHENS, JOSEPH R.**
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LEW-14609 B88-10424 04
- Strategic Materials For Superalloys
LEW-14665 B88-10588 04
- Fiber-Reinforced Superalloys For Rocket Engines
LEW-14871 B90-10346 04
- STEPHENS, WILLIAM E.**
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NPO-16684 B87-10160 01
- STERLING, S. ELMO, JR.**
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LAR-13277 B86-10083 08
- STEVENS, EVERETT G.**
Ceramic Adhesive for High Temperatures
MSC-21085 B87-10504 08
- STEVENS, GRADY H.**
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LEW-14548 B88-10084 02
- STEVENSON, C. R.**
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NPO-16441 B86-10421 02
- STEVENSON, ROBERT**
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LAR-13938 B89-10185 06
- Optimizing Simulated Trajectories Of Rigid Bodies
LAR-13939 B89-10186 06
- STEVENSON, STEVEN M.**
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LEW-14548 B88-10084 02
- STEVENSON, WILLIAM A.**
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LAR-14040 B90-10678 08
- STEWART, DAVID A.**
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ARC-11680 B88-10108 04
- Heating Distributions For Aeroassisted Vehicles
ARC-11754 B88-10306 06
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ARC-12156 B90-10225 03
- STEWART, GERALD M.**
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MFS-29527 B90-10246 08
- STEWART, ROBERT M.**
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LAR-13539 B87-10178 04
- STEWART, SCOTT R.**
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NPO-17493 B90-10568 01
- STIEGMAN, ALBERT E.**
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NPO-17572 B89-10235 04
- STIRN, R. J.**
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NPO-16475 B86-10500 04
- STIRN, RICHARD J.**
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NPO-17399 B89-10378 08
- STOAKELY, DIANE M.**
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LAR-13902 B90-10408 04
- STOAKLEY, D. M.**
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LAR-13447 B86-10499 04
- STOAKLEY, DIANE M.**
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LAR-13669 B88-10526 04
- Tensile Film Clamps And Mounting Block For Viscoelastometers
LAR-13696 B89-10625 06
- STOKES, LEBARIAN**
"Smart" Electromechanical Shock Absorber
MSC-21368 B89-10191 06
- STOLLER, F. W.**
Photogrammetry Of A Parabolic Antenna
NPO-17088 B88-10460 01
- STOLTZFUS, JOEL M.**
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MSC-21470 B90-10456 03

- STONE, F. D.**
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DRP2L2
LAR-13310 B87-10007 02
- STONE, N.**
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MFS-26122 B86-10431 03
- STOREY, RICHARD W.**
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LAR-13837 B90-10056 03
- STORMO, JERRY**
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MFS-27081 B87-10182 04
- STOTT, F. R.**
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NPO-16028 B86-10316 01
- STOUGHTON, JOHN W.**
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LAR-13552 B90-10217 02
- STOWE, DAVID W.**
Advanced Components For Fiber-Optical Systems
NPO-17080 B89-10049 01
- STRAND, L. D.**
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NPO-16487 B86-10122 03
- STRAND, LEON D.**
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NPO-17428 B90-10525 03
- STRAND, VICTOR**
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Remotely
MSC-21086 B87-10355 07
- STRAYER, DONALD M.**
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NPO-16663 B87-10308 01
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NPO-17157 B88-10263 01
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Superconductors
NPO-17504 B89-10221 03
Ultra-Stable Superconducting-Maser Oscillator
NPO-17090 B89-10270 01
- STRECKER, MYRON T.**
Lightweight Monorail Transport System
MSC-21119 B87-10361 07
- STREMPKE, FRANKLIN**
Compliant Robot Wrist Senses Deflections And
Forces
GSC-12868 B89-10083 06
- STRGANAC, THOMAS W.**
Predicting Unsteady Aeroelastic Behavior
LAR-14130 B90-10480 06
- STRIEPENS, ALOYS H.**
Measuring Thermal Conductivities Of Rough
Specimens
MSC-21333 B89-10076 06
- STROUB, ROBERT H.**
Improved Hub Fairings For Helicopters
ARC-12288 B90-10236 06
- STROUD, C. W.**
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LAR-13502 B87-10076 04
- STRUNING, ALBIN J.**
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MSC-21338 B89-10273 01
- STUBBS, SANDY M.**
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LAR-14030 B90-10472 06
- STUCK, DONALD E.**
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MFS-19375 B87-10197 06
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MFS-29429 B90-10111 06
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MFS-29594 B90-10490 08
- STUCKENBERG, F. H.**
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MSC-20882 B86-10085 08
- STUCKEY, J.**
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MFS-27129 B86-10478 08
- STUDER, P. A.**
Magnetic Bearing With Radial and Angular Control
GSC-12957 B87-10143 07
Three-Axis Attitude Control With a Single Wheel
GSC-12970 B87-10144 07
- STUDER, VICTOR J.**
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MSC-21346 B89-10341 01
- STUSNICK, ERIC**
Space-Station-Interior Noise-Analysis Program
LAR-13766 B88-10293 06
- SUBBARAMAN, M. R.**
Photochromic Polyaphrons For Visualization Of Flow
MFS-29259 B88-10237 04
- SUCCOP, G.**
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LEW-14281 B87-10136 06
- SUDDATH, FRED L.**
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MFS-26088 B89-10476 08
- SUDOL, E. D.**
Making Latex Microspheres in Space
MFS-27085 B86-10192 08
- SUE, M. K.**
High-Capacity Aeronautical Satellite Communication
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NPO-17234 B88-10565 02
- SUGGS, R. J.**
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MFS-26064 B88-10608 08
- SUGIMURA, R. S.**
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NPO-17305 B89-10342 01
- SUGIMURA, RUSSELL S.**
Endurance Tests Of Amorphous-Silicon Photovoltaic
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NPO-17304 B89-10012 01
Photovoltaic Generation Of Power By Utilities
NPO-17091 B89-10016 02
- SUITOR, J.**
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NPO-16605 B86-10461 07
- SUITOR, JERRY W.**
Energy-Efficient, Continuous-Flow Ash Lockhopper
NPO-16985 B89-10316 07
- SULJAK, GEORGE T.**
Protecting Fuel Cells From Drowning
MSC-21477 B89-10506 03
- SULLIVAN, JOHN E., JR.**
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Inspections
MFS-28388 B90-10074 08
- SUMIDA, JOE T.**
DMSK Receiver For Mobile/Satellite Service
NPO-16659 B89-10057 02
Automatic Frequency Control For DMSK Receiver
NPO-17021 B89-10058 02
- SUMMERS, DAVID**
Hydromechanical Advanced Coal Excavator
NPO-16442 B90-10604 07
- SUMMERS, R. L.**
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Measurements
LEW-14646 B88-10522 03
- SUN, J.**
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NPO-17310 B90-10007 02
- SUNDBERG, GALE R.**
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LEW-14654 B89-10216 01
- SUNSERI, RICHARD F.**
Simulation Of Satellite Trajectories And Navigation
NPO-17442 B89-10130 06
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NPO-17201 B89-10458 06
- SUPAN, E. C.**
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MFS-27216 B89-10204 08
- SUPPLEE, FRANK H., JR.**
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LAR-13294 B86-10257 06
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LAR-13564 B88-10349 06
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LAR-13710 B89-10135 06
- SURGENOR, DOUGLAS M.**
Extending The Shelf Life Of Blood Platelets
MSC-21157 B88-10554 05
- SUTTON, J.**
Oscillator or Amplifier With Wide Frequency Range
GSC-12960 B87-10264 01
- SVEJKOVSKY, PAUL A.**
Relief Valve Opens And Closes Quickly
MSC-21209 B88-10428 06
- SWAIM, BENJI D.**
Multihole Arc-Welding Orifice
MFS-28322 B89-10576 08
- SWAMINATHAN, KUMAR**
Quantile Vocoder
NPO-16829 B88-10468 02
- SWAMINATHAN, N.**
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MSC-21093 B89-10074 09
- SWANIC, A.**
Self-Alining Electrical Connector
MFS-26022 B86-10198 01
- SWANSON, CHARLES P.**
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MFS-28287 B90-10021 06
- SWANSON, LAIF**
Coding Strategy For Critical Data
NPO-16630 B88-10203 09
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NPO-17037 B90-10037 09
- SWANSON, THEODORE**
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GSC-13199 B89-10558 04
- SWARTZ, ARI BEN**
Ozone/Ultraviolet-Photo-Oxidation Reactor
MSC-21488 B89-10511 04
- SWEC, DIANE**
Protective Coatings for Spacecraft Polymers
LEW-14384 B87-10467 04
- SWEC, DIANE M.**
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- SWENSON, HARRY N.**
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ARC-11699 B88-10276 02
- SWICK, E. G.**
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NPO-16417 B87-10044 08
- SYDNOR, R. L.**
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- SYKES, H.**
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- SYNOTT, DEBRA J.**
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- SZAKALY, ZOLTAN F.**
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NPO-17134 B88-10016 02
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NPO-17401 B89-10548 02
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NPO-17520 B89-10552 02
Improved 'Smart' Robot Hand
NPO-17917 B90-10570 02
- SZALKAY, H. G. H.**
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ARC-11686 B87-10104 05
- SZEMA, K.**
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LAR-13413 B86-10336 06
- SZUCH, JOHN R.**
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- TAKAHASHI, TED H.**
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- TAM, L. T.**
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- TAMKIN, GLENN**
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- TANNEHILL, JOHN C.**
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ARC-12146 B90-10240 06
- TANNER, JOHN A.**
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LAR-13815 B89-10255 06
- TANZER, HERBERT J.**
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LAR-13956 B89-10564 06
- TAPPHORN, RALPH M.**
Two Radiative/Thermochemical Instruments
MSC-21639 B90-10580 03
- TARN, TZYH J.**
Robot-Arm Dynamic Control by Computer
NPO-16742 B87-10317 02
- TAROKH, MAHMOUD**
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NPO-17647 B90-10308 09
- TARVER, D. KENT**
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NPO-16623 B89-10112 02
- TASAKI, KEIJI**
Flight Dynamics Analysis System
GSC-13163 B90-10288 09
- TATON, F. B.**
Derivatives of the Arithmetic-Geometric Mean
MFS-26018 B86-10096 09
- TAUBER, MICHAEL E.**
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ARC-11790 B89-10085 06
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- TAULBEE, ZOE A.**
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- TAUSWORTHE, R. C.**
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- TAWEL, RAOUL**
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- TAYLOR, ALLAN**
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LAR-13435 B87-10247 08
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LAR-13926 B90-10496 08
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NPO-17353 B88-10582 03
- TAYLOR, LAWRENCE W., JR.**
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LAR-14059 B90-10606 08
- TCHENG, P.**
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LAR-13294 B86-10257 06
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LAR-13507 B87-10211 05
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LAR-13564 B88-10349 06
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LAR-13710 B89-10135 06
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- TEEL, J. R.**
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- TELL, ROBERT G.**
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NPO-16972 B89-10164 02
- TELLIER, G.**
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- TELLIER, JIM**
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- TEMPLE, G.**
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ARC-11707 B87-10512 01
- TEPPER, EDWARD H.**
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- TESKE, M. E.**
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- TETSUKA, GEORGE M.**
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- THAKOOR, A. P.**
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NPO-16681 B86-10132 04
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NPO-17690 B90-10572 02
- THAKOOR, ANILKUMAR P.**
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NPO-16680 B88-10015 02
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- THAKOOR, SARITA**
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- THALLER, LAWRENCE H.**
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- THEBERT, GLENN W.**
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ARC-11627 B87-10358 07
- THEISINGER, PETER C.**
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- THOMANN, DAVID G.**
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- THOMAS, CLARK S.**
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- THOMAS, J. B.**
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- THOMAS, SCOTT D.**
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MFS-28440 B90-10514 02
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- THOMPSON, D. C.**
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- THORESON, DOUGLAS W.**
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MSC-21215 B88-10121 06
- THORNTON, CATHERINE L.**
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NPO-17386 B89-10313 06
- THORNTON, DAVID N.**
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MSC-21704 B90-10623 02
- TIANLAI, HU**
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- TIESENHAUSEN, GEORG VON**
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- TIFFANY, S. H.**
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LAR-13457 B86-10345 09
- TILGHMAN, CHRIS**
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MFS-28288 B89-10420 08
- TILLER, NEWTON G.**
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- TING, EDMUND Y.**
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- TISCHLER, M. B.**
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- TISCHLER, MARK B.**
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- TISCHNER, R. L.**
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- TITRAN, R. H.**
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LEW-14325 B86-10450 04
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LEW-14831 B90-10347 04
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- TOMAZIC, WILLIAM A.**
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- TONIS, W. T.**
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- TORRES, FRANCISCO J.**
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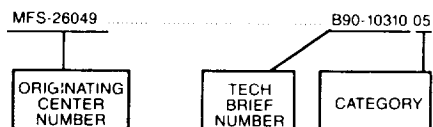
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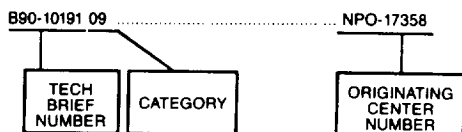
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